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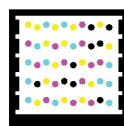


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Get more green at [www.ecohomemagazine.com](http://www.ecohomemagazine.com), including Web-exclusive case studies, green builder profiles, and product category reviews. You'll also find:

- Exclusive coverage from the 2011 Builders' Show, including information and advice from educational sessions and new green products.
- Follow Maryland builder Bethesda Bungalows' latest green-built home from start to finish.
- Web-exclusive case studies, including an ultra-strong, ultra-efficient Florida concrete home.

## Case Studies

### bellevue, wash: zero energy idea house

A husband-and-wife builder team creates an educational laboratory for green living. | **PAGE 22**

### auburn, ala.: sustainable farmhouse

Generations-old siting techniques, high-performance products, and state-of-the-art energy modeling help shape this rural getaway. | **PAGE 28**

## Reviews

### tank-type water heaters

As new technologies emerge, efficiencies among tank-style water heaters are climbing. | **PAGE 35**

### exterior cladding

There's no shortage of siding options for green homes. Here are the attributes to look for. | **PAGE 43**

## Departments

### editor's note

The growth in understanding of how buildings work as integrated systems is one of the most important developments in our industry. | **PAGE 7**

### ecoupdate

International Builders' Show preview | New York's first Passive House | Environments for Living marks milestone | First WaterSense production homes | LEED update | **PAGE 9**

### building science

Understanding advanced rainscreens. | **PAGE 17**

### aiarchitect

Wisconsin house proves how salvage can trump starting from scratch. | **PAGE 21**

### new + notable

A wind turbine, wood flooring, permeable pavers, insulation, and more. | **PAGE 50**

### greenwatch

The ultra-stringent Living Building Challenge standard drives even the greenest builders into new territory in the search for true sustainability. | **PAGE 56**

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**For subscription orders or inquiries:**

In U.S. call 888.269.8410; international call 847.291.5221

Online: [www.ameda.com/ecohome](http://www.ameda.com/ecohome) (orders only) Fax: 847.291.4816 Back issues: Call 888.269.8410

**For reprints:** The YGS Group, 717.505.9701 x128 Fax: 717.825.2150

**Privacy of Mailing List:** We rent our subscriber list to reputable companies. If you do not wish to receive promotional mail from other companies, please call us, toll-free, at 888.269.8410.

**Postmaster:** Please send address changes to EcoHome, P.O. Box 3494, Northbrook, IL 60065-9831.

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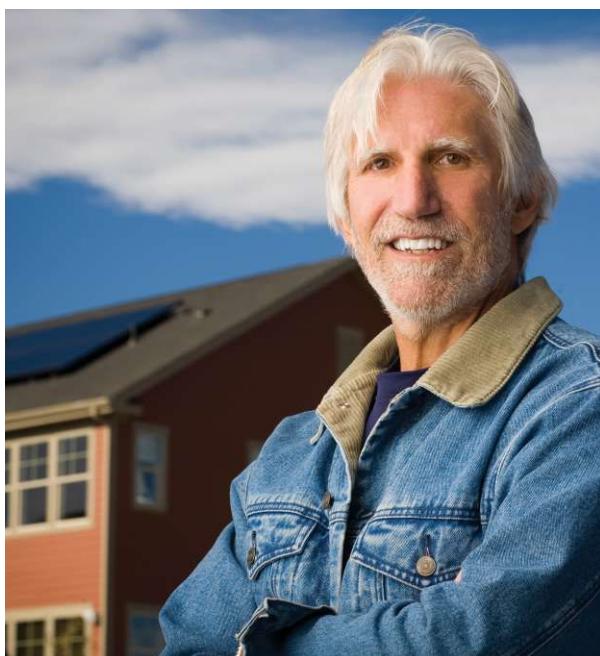


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# Applied Science

**T**he growth in understanding of building science and how buildings work as integrated systems is one of the most important developments in the recent history of our industry, and if you are not yet intensely focused on this overarching technical discipline, you should be. Without a doubt, some aspect of the success or failure of your green building projects will relate directly to how well you apply building science principles and details to your designs and construction processes. We've all heard how green building equates to higher quality construction; that level of quality is largely due to building science.

Every year continuing research deepens our understanding and expands our abilities to apply successful materials and details for greater performance. No longer can we afford to think of building materials, products, and systems as separate from each other, because we understand that they respond and perform as integral building components influenced by the variable effects of climatic and environmental factors, occupant behavior, and materials' properties.

Everything is in play in today's tighter and more complex homes, from basic flashing details to advanced exterior rainscreens and drainage planes, from insulation and air sealing techniques to evolving vapor control and ventilation strategies. And now, with deepening knowledge and concerns about the ingredients contained in our building products, we need to focus even more on indoor air quality.

For every decision at every stage of design, and especially around product selection and installation details, somebody needs to ask, "Have we

addressed the building science considerations here?" And then, for every construction assembly during every phase of construction, somebody who knows what to look for needs to watch over the work and enforce the best practices.

We've come a long way since the days when building scientists were mostly guiding us through the mess of mold and mildew. Those problems exposed critical failures, focused our attention to detail, and made everyone realize that building science is absolutely relevant. With architects and builders finally paying attention, building science pioneers like Joe Lstiburek, Betsy Pettit, Terry Brennan, Mark LaLiberte, Gord Cooke, and Justin Wilson have educated tens of thousands of builders across the country and changed the way we build.

And just as green building requires a holistic view of buildings as systems, building science requires us to look more closely at the interactions between their specific materials and components in combination, and under the dynamic conditions presented by their locations and occupants.

I mention all this as a way of emphasizing our own focus on these issues through our award-winning Building Science column written the past three years by Mark LaLiberte and Gord Cooke of Construction Instruction (CI). This year, with the increasing importance, accelerating advancements, and expanding practices encompassing building science, including indoor air quality, we are adding two more experts to our editorial team: CI's Justin Wilson, and Bill Walsh, founder of the Healthy Building Network and Pharos. It would be hard to find a more experienced or powerful team.

Take what you learn from them, pass it on to your own team, and put it into practice.

## Welcome, AIA Members!

This issue of EcoHOME marks the beginning of our editorial relationship with the American Institute of Architects and designation as "A Magazine of the AIA," along with our sister publications ARCHITECT, RESIDENTIAL ARCHITECT, and ECO-STRUCTURE. Look for exclusive coverage of sustainable projects from AIA architects in each issue (see page 21), with design strategies for architects and contractors alike. We are proud to add AIA members to our readership who are among the leaders in environmental design.

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# Builders' Show Preview

Green products and programs from the home building industry's largest event.

The International Builders' Show returns to Orlando Jan. 12–15. Here's a sneak peek at five green products that will be introduced. And be sure to check [ecohomemagazine.com](http://ecohomemagazine.com) during and after the show for coverage of educational sessions and more products from the exhibit floor.



**MOEN.** 90° faucets feature a minimalist design highlighted with sharp geometric angles. A single-handle, single-hole mount style and a two-handle wide-spread style are available. The flow-optimized lavatory faucets are WaterSense certified, operating at 1.5 gpm. They come in brushed nickel or chrome. All single-handle faucets in the collection also feature the maker's 1255 Duralast ceramic-disc cartridge for smooth operation and durability. 800.289.6636. [www.moen.com](http://www.moen.com). Circle 370. Booth #W1901. —Lauren Hunter



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**SEAGULL LIGHTING.** New to the manufacturer's Ambiance Lx linear low-voltage lighting system, the LED festoon lamp is ideal for task and accent lighting, including undercabinet and cove applications. The lamps have a life span of 35,000-plus hours, are dimmable with a standard dimming switch, and are available in cool white and warm white color temperatures. They can be used in retrofit applications by snapping into existing Ambiance Lx systems and many standard xenon systems. 800.347.5483. [www.seagulllighting.com](http://www.seagulllighting.com). Circle 372. Booth #W5059. —Katy Tomasulo



**TREX.** The composite deck manufacturer now offers dimmable LED deck lighting, for an energy-efficient way to add safety and ambiance. The compact, weather-proof lights use 75% less energy than traditional incandescent lighting and last for up to 40,000 hours, the company says. Four styles are offered: a post cap light for a warm downward glow; a deck rail light; a flush-mounted riser light available in white, black, and bronze; and a recessed deck light, which installs flush into the deck for subtle accents. 800.289.8739. [www.trex.com](http://www.trex.com). Circle 373. Booth #W2571. —K.T.



**GERBER.** Additions to the manufacturer's Avalanche toilet family include the Avalanche Leak Sentry and a gravity-fed one-piece unit. The LS model (shown) features a Fluidmaster Leak Sentry Pro Fill valve that eliminates toilet run-on when not in use. The gravity-fed unit is available in a one- or two-piece option, and uses the company's most sophisticated and powerful single-flush system. Both products operate at 1.28 gpf and feature a 3-inch flush valve. 866.538.5536. [www.gerberonline.com](http://www.gerberonline.com). Circle 374. Booth #W4017. —Nigel F. Maynard

## GREEN BUILDING SESSIONS

As usual, the Builders' Show will include a number of educational sessions geared toward green building, including:

- **A Builder's Guide to Constructing a Net-Zero-Energy Home** (Jan. 12, 10–11:30 a.m.)
- **Energy Labeling Is Here: How Will It Affect You?** (Jan. 12, 10–11:30 a.m.)
- **Green Builders as Educator to Lenders and Appraisers** (Jan. 12, 3:30–5 p.m.)
- **Subcontracting Green: Scopes of Work for High Performance Construction** (Jan. 13, 1:30–3 p.m.)
- **Legal Compliance for Green Building** (Jan. 14, 10–11:30 a.m.)
- **Selecting the Most Cost-Effective Green Practices for Affordable Green-Certified Homes** (Jan. 14, 1:30–3 p.m.)

PROJECT SPOTLIGHT

# New York's First Passive House

Hudson Valley Project showcases the ultra efficiencies of this German-born standard.

The exterior of the Hudson Passive House may exude the traditional barn-like stylings of the historic New York Hudson Valley, but behind the wood and stone cladding is an ultra-tight, super-insulated home that meets the stringent certification requirements of the Passive House program.

Originating in Germany as “Passivhaus” and now gaining followers in the United States, the rigorous standard relies on super-insulated, virtually air-tight construction techniques along with passive solar design features to reduce heating-energy consumption by up to 90%. The practices, developed and continually evolving through energy modeling research, rely primarily on design principles rather than supplemental mechanical technologies. The result? A Passive House uses about 15 million BTUs a year, according to the Passive House Institute, compared to about 94.6 million BTUs for the average new U.S. home.

Building on their years of experience with high-performance homes, architect Dennis Wedlick and Bill Stratton Building Co. embarked on the project to demonstrate the performance potential of ultra-tight construction.

To achieve efficiency goals for the 1,650-square-foot, three-bedroom, two-bath house, Wedlick focused on five core areas: a compact shape, continuous insulation and elimination of thermal breaks, passive solar gain, air circulation with heat recovery, and air leak prevention.

The timberframe structure features glulam beams and SIPs, chosen as an easier method for minimizing thermal bridging versus double-stud walls. The 12 ¼-inch-thick Timberline SIPs provide an R-value of 50 for the walls and 53 for the roof. The team insulated the foundation to R-60 using six layers of EPS foam beneath the slab and XPS foam on the interior and exterior of the walls.

Wedlick says maximizing insulation



The Hudson Passive House's barn-like structure reflects the rural aesthetic of the region; inside, timberframe beams frame a modern, open floor plan centered around a soaring wall of windows.

performance and minimizing leakage relies on techniques that are simple but that require close supervision. The efforts paid off: In a blower-door test, the house measured 0.149 ACH@50 Pascals, well below the Passive House requirement of 0.6.

Though barn-inspired in shape and cladding materials, the structure's south-facing glass wall provides for a modern feel as well as ample daylighting; the R-7 triple-pane windows from Serious Materials are shaded in summer by the A-frame overhang.

Just four structure bays enclose the usable space, simplifying construction and minimizing material use and waste.

With no drafts, the inside air moves “gracefully,” Wedlick describes, aided by the open, loft-like floor plan and a Zehnder heat recovery ventilator.

Though the high-performance wall system costs more than traditional structures, the lower HVAC requirements, which Wedlick estimates cost about one-quarter of that of a typical new home, helped keep construction costs between \$200 to \$250 per square foot, a figure he says is comparable to typical homes in the area.

The architect will monitor the demonstration house, which was completed last October, for a year to measure the energy performance brought about by smart design.

“It's not the technology, it's the architecture,” says Wedlick. “We want to empower industry practitioners and homeowners with the understanding that better-built, better-designed homes can be a powerful and relatively simple way to conserve our nation's resources.” —K.T.



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# Environments For Living Marks Milestone

Pioneering program reaches 140,000 certified homes.

In the 10 years since its launch, the Environments For Living (EFL) program has steadily gained traction among leading home builders across the country, and this year certified its 140,000th home. Initiated by Masco Home Services, the program was one of the first home certifications to base its criteria on building science, relying on early input from Joe Lstiburek of Building Science Corp. and continued focus

installation of carbon monoxide detectors. Certified Green-level homes meet additional requirements for internal water efficiency, including fixtures and plumbing layout, as well as lighting and appliance efficiency criteria.

For all EFL homes, the process begins with a plan review to benchmark practices, identify changes, and estimate costs, and continues through construction with visual inspections

to view framing, air barrier and thermal envelope integrity, flashing details, and other systems required for certification. And while EFL requirements complement other rating systems like Energy Star, the DOE Builders Challenge, LEED, and the National Green Building Standard (NGBS), programs that many EFL builders also use, EFL does not address site and location considerations contained in LEED and the NGBS.

EFL does require performance testing of all its

homes, and after achieving EFL certification, Masco Home Services offers two unique limited guarantees to the original homeowners: a Heating and Cooling Energy Use guarantee that will fully reimburse homeowners for heating and cooling expenses beyond the modeled energy requirements simulated for that home in a typical weather year, and a Comfort guarantee that "... guarantees the original homeowner that the temperature at the location of the thermostat in the home will not vary more than +/- 3 degrees from the temperature at the center of any conditioned room within that thermostat zone."

For more information on EFL, visit [www.environmentsforliving.com](http://www.environmentsforliving.com); to learn about Masco Home Services' WellHome remodeling program, visit [www.wellhome.com](http://www.wellhome.com). —Rick Schwolsky



David Weekley Homes, one of many production builders in the program, is building EFL Platinum-level homes in nine markets.

by its director David Bell, a veteran building scientist himself. "Environments for Living was created from the start to educate builders about building science," Bell says. "Over the years, by working with companies like Pulte, KB Home, D.R. Horton, Beazer Homes, David Weekley, and Lennar, we're helping builders differentiate themselves in their markets, and raise the industry's standards."

EFL certification requires builders to meet performance-based criteria to achieve either Gold, Platinum, or, its highest, Certified Green through mandatory measures that ensure a tight air barrier and thermal envelope, right-sized HVAC equipment with properly located and tested duct systems, intentional fresh air ventilation, moisture and water management details, room-by-room pressure balancing, and required

## First WaterSense Production Homes Completed

Los Angeles-based KB Home has completed four houses in its Springwood neighborhood near Sacramento, Calif., the first production community in the country to earn the EPA's WaterSense label for new homes.

The 1,604- to 2,597-square-foot homes will come standard with WaterSense, Energy Star, and California GreenPoint Rated certifications at no extra cost to buyers. With prices starting in the mid \$200,000s, they'll be affordable for even first-time buyers in the market, according to KB Home director of corporate communications Craig LeMessurier.

WaterSense-labeled homes, designed to use 20% less water than a typical new home, are independently inspected and certified. Features in the Springwood houses include:

- Water-efficient showerheads and kitchen and bath faucets from Moen
- Sterling 1.28-gpf toilets
- Metlund's D'mand hot water distribution system with an on-demand recirculation pump
- Water-efficient landscaping with a Hunter irrigation controller

Springwood, located just east of Sacramento in Roseville, Calif., will be the first of three KB Home communities built to these guidelines. The company will soon announce the expansion of the program to communities in Austin, Texas, and Orlando, Fla., LeMessurier says. —Jennifer Goodman



Four houses in KB Home's new development have achieved WaterSense certification.



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## LEED for Homes Update

The first of two public comment periods for proposed updates to the USGBC's LEED rating systems and credits, including LEED for Homes (LEED-H), will close on Jan. 14. The second period will run from July 1 through Aug. 15, 2011, with a projected release



of revised LEED requirements set for November 2012. Overall goals of the LEED-H updates will be to streamline the certification process, reduce paperwork, and move toward performance-based criteria. "LEED has always pushed codes," LEED for Homes technical development manager Asa Foss said during the 2010 Greenbuild conference. "And whenever we stretch the LEED requirements we try to balance how far to go and how fast."

Specific proposed changes to the LEED-H rating system include:

- Changing the certification point scale from 136 points to 100 points to align with other rating systems

- Weighting credits within their categories to reflect their environmental impact

- Updating Energy and Atmosphere credits to meet new Energy Star for Homes Version 3.0 requirements

- Requiring all projects to complete Energy Star 3.0 HVAC inspection checklists

- Adding 10 new credits including those for trades training, WaterSense Homes certification, solar-ready rough-ins, and HRVs and ERVs

- Addressing plug load management.

Perhaps the most significant changes would shift credits from relative performance comparisons like HERS rating levels to what Foss referred to as "absolute metrics" for annual energy consumption. This performance pathway would establish a prerequisite for "Maximum Absolute Energy Performance," and award credits to "Optimize Absolute Energy Performance."

This new approach would actually reward

design decisions that affect performance in ways that a prescriptive path can't, and offer fairer comparisons between homes—including existing homes. "The real metric here," added Foss, "is the total energy consumed."

Many of the changes to LEED-H that are under consideration by the USGBC have been stimulated in part by new Energy Star 3.0 requirements going into effect this month. Energy Star levels are referenced as baselines in a number of LEED credit practices, so changes to Energy Star would by definition affect the LEED Rating System. Energy Star 2011 provisions include new building science-based requirements, measures to reduce thermal bridging, a change to a variable HERS threshold that will lead to lower HERS ratings, and new checklists covering Thermal Enclosure System, HVAC System Quality Installation, and Water Management.

Visit [www.usgbc.org](http://www.usgbc.org) and click on "LEED Rating System Draft" to review proposed changes and submit comments. —R.S.

## EcoBriefs

In its 2010 "Sins of Greenwashing" report, environmental marketing company TerraChoice found some form of greenwashing in more than 95% of consumer products labeled as "green." The construction sector by itself fared only slightly better, with greenwashing evident in close to 94% of eco-marketed products. ■ **Proposed benchmark standards to determine which wood-certification groups** can have their programs qualify for points under the LEED rating system failed to win the required two-thirds approval in November, representing the rejection of several years' worth of work by a USGBC committee and guaranteeing even more fighting over one of green construction's most bitterly debated issues. Fifty-five percent voted for the plan that would have potentially expanded the number of wood-certification groups recognized under USGBC's rating system, which currently only awards points for FSC-certified wood products. ■ In the **AIA's third quarter 2010 Home Design Trends Survey**, residential architecture firms reported that access to public transportation and mixed-use facilities has increased substantially in popularity since 2009, along with continuing high demand for infill development. ■ The EPA and the DOE recently proposed an **expansion of the Energy Star Qualified Products program** with a "top tier" designation for products that surpass the more common levels of energy efficiency within their categories. ■ **BuildingGreen and the Healthy Building Network**, two of the industry's most respected organizations providing independent green product research, have announced a partnership to link their product evaluation and selection tools—the *GreenSpec Directory* and the *Pharos Project*. ■ **Sylvania's third annual Socket Survey** found that a growing number of Americans—36%, up 10% since last year—are aware of the phase-out of traditional incandescent light bulbs. The research also found that consumers are already beginning to embrace more efficient options, with 72% of households using at least one CFL bulb, 39% using halogen, and 9% using LEDs, and that the majority are planning to switch to these technologies (instead of to lower-wattage incandescents) when the new rules take effect. ■ The **DOE announced the release of Home Energy Score**, a pilot program that grades houses based on their energy performance versus others in the region and provides customized recommendations for energy cost reduction. The agency also released the **Workforce Guidelines for Home Energy Upgrades**, designed to develop and expand contractors' skills while laying a foundation for a more robust national certification and training program. —Excerpted from online reports. To view full versions of these news items, visit [www.ecohomemagazine.com](http://www.ecohomemagazine.com).



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**Mark LaLiberte**

*Mark LaLiberte, partner with Construction Instruction, is a highly regarded green building consultant who helps builders nationwide understand and apply proper building science construction principles to improve their homes.*  
[www.construction-instruction.com](http://www.construction-instruction.com);  
[www.laliberteonline.com](http://www.laliberteonline.com).

# Advanced Rainscreens

New research, code requirements, and material assemblies drive strategic changes.

**T**he continuing effort to improve energy efficiency has affected nearly every aspect of buildings—most notably, changes to building enclosure designs driven by new codes, more stringent rating system requirements, higher energy costs, and ongoing research. Results from recent field studies and decades of laboratory research demonstrate that, because of increasing levels of wall and attic insulation, coupled with cladding system changes and complexities, we need to enhance the drying potential of walls in every climate.

Our wall systems have to withstand ongoing variable conditions that change hourly, daily, and seasonally. These fluctuations affect energy use, wetting and drying potential, and therefore the life of the building. To explain this idea, let's define the performance expectation for sheathings.

## WHAT WE KNOW

Most sheathing materials we use are moisture sensitive. While providing structural and nail base functions, exterior materials also need to manage rain, possibly contribute to air barrier functions, provide thermal resistance, and have some vapor-tolerant features if the conditions and climate dictate. This explains why the complexity of making good decisions for a building enclosure is critical to its long-term success. After the cladding is installed we have few options to improve missing features.

## WHAT WE CAN DO

The complex performance challenges buildings experience are variable enough that we need to begin designing in some “forgiveness” for when material tolerances are exceeded. It is often assumed that sheathing can provide a safe storage capacity for moisture. In almost every case, these materials have little additional storage capacity other than what they store seasonally. It is therefore recommended that drainage planes be enhanced and, in many cases, coupled with rainscreen techniques that accelerate the removal of liquid water and when properly designed use air flow to enhance the drying rate significantly.

Research at the University of Waterloo in Ontario by Dr. John Straube and his team of scientists has shown the benefits of using a 3/8-inch to 3/4-inch venting rainscreen. The data show a significant increase in drying potential versus a conventional wall with simple building paper and no ventilation space. Based on this and other research we can conclude that a ventilated rainscreen accelerates evaporation of undrained moisture behind cladding materials nearly three times faster than without ventilation. It is important to note that a majority of the moisture will drain from the wall system when an effective drainage plane is used. This is in combination with the accelerated drying times with vented wall systems. Other studies by Mark F. Williams with Williams Building Diagnostics show that vented rainscreens are the best method we can use to ensure long-term performance and durability.

## EFFECTIVE TECHNIQUES

The best practice in rainfall regions with greater than 20 inches per year is creating an intentional airspace between the cladding and sheathing by installing furring strips or drainage mats over the weather resistive barrier (behind the cladding) that create at least 3/8 inch to 3/4 inch of airspace. This requires some planning to detail the type of furring strips, cavity depth, possible use of exterior rigid foam or mineral fiber insulation, window installation sequence, penetrations, and trim details. This might sound complex, but planning ahead will make the experience work well.

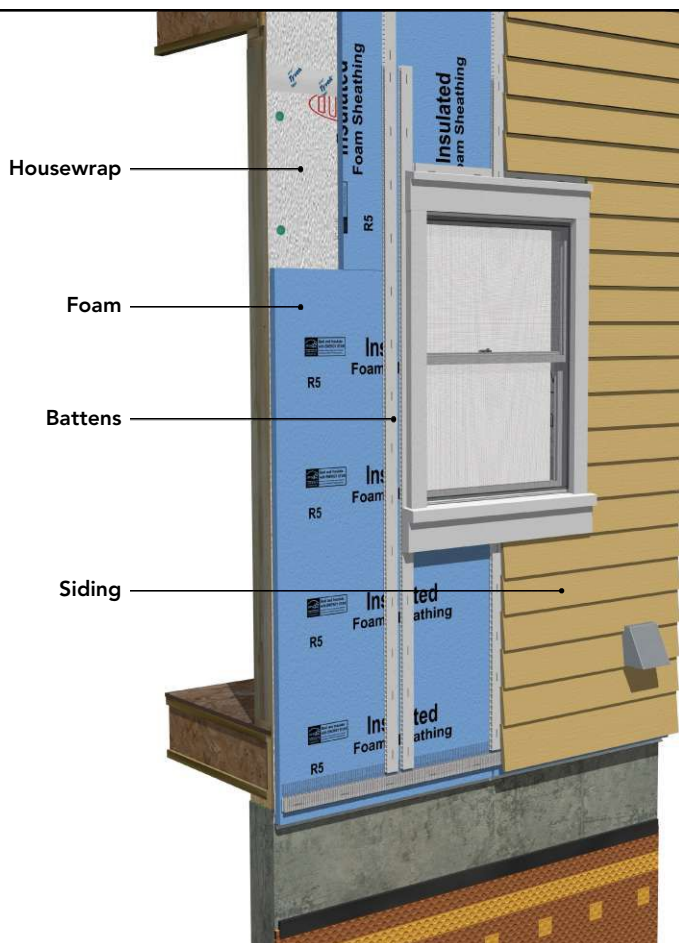
Figure 1 (page 18) shows a typical wood-framed wall with a draining housewrap installed over the sheathing. The window is installed and flashed at the sheathing interface, and the air barrier is the housewrap. Ventilation behind the cladding is enhanced by the batten system installed over the housewrap. In Figure 2 you can see a well-installed and flashed weather barrier with foam and 3/8-inch wall battens spaced 16 inches on center behind the siding. (See page 18 for information on how to download these animated construction details from Construction Instruction's new mobile app for iPhones and iPads.)

These techniques are effective methods for draining and drying excess water. The best drying performance is achieved by installing ventilation

FIGURE 1: WINDOW INSTALLED TO SHEATHING



FIGURE 2: WINDOW INSTALLED TO FOAM



These illustrations show how to create vented airspaces behind exterior cladding over different exterior sheathings. Figure 1 details battens installed over housewrap. Figure 2 shows how to adapt the details and sequence when rigid foam is installed.

openings at both the bottom and top of the wall. There also needs to be an insect screen at the base and at the top to protect the space. The battens shown in Figure 2 are called Eldorado battens, and they allow airflow both vertically and horizontally. They are shown at ½ inch deep and 2 inches wide. Other methods include Benjamin Obdyke's Home Slicker and Cosella-Dörken's Delta Dry, among others.

It's a great idea to build a mock-up of the method you will be using to work out the cladding and trim details before you put it on the house. Once you create the best approach, you'll find it works very well, extends the paint film life, and allows all cladding systems like stucco, manufactured stone, cement siding, and wood to perform as they should and experience fewer callbacks.

#### LOOKING AHEAD

We know that reductions in energy use in buildings have been targeted by both codes and rating

systems, citing a net-zero goal for new homes by 2030 (California hopes to achieve this by 2020). The new requirements for Energy Star Version 3 are taking a step-down approach improving the requirements as codes catch up. This will help builders reach these national goals in a strategic approach.

Regulations will always lag behind a best-practice approach. In January 2010, Oregon, with the assistance of the Oregon Home Builders Association and using information from the Waterloo research and Williams study, passed a code requiring a ¼-inch minimum draining space unless an effective draining housewrap was used. Most of the building science community hopes it doesn't take laws to inspire good building techniques. Detailing buildings with proper flashing, rainscreens, and improved thermal performance is where our industry needs to head now.

*Justin Wilson with Construction Instruction contributed to this article.*



These details are available free to EcoHOME readers in action-sequenced animation using Construction Instruction's new mobile app for iPhones and iPads. Visit [ecohomemagazine.com](http://ecohomemagazine.com) to download the apps.

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PHOTO: JOHN J. MACAULAY

## A Tale of Two Houses

A better house emerges from the skeleton of an old one, proving that salvage can trump starting from scratch. *BY CHERYL WEBER*

**WHEN ASKED TO DESIGN A HOUSE, IT IS ASSUMED ARCHITECTS WOULD** rather start with a blank canvas than reinvent an existing structure. That's especially true when the house is of no particular provenance—say, a bi-level production home near the end of its life cycle. Clients, too, often overlook the opportunities to piece together old and new.

An exception is Eric and J.J. Edstrom, who live in a wooded subdivision west of Milwaukee. After 10 years in their boxy 1970s-era home, the couple agreed that its 1,300 square feet was roomy enough for them and their young daughter, even if it was dull and dysfunctional. They wanted a modern, compact design, one that would salvage the building's still-viable structural parts.

The couple enlisted Milwaukee-based Johnsen Schmalig Architects, who saw the project as a chance to experiment with using the foundation, perimeter walls, and plumbing stacks of an outmoded structure as the framework for a new one. Architects Brian Johnsen, AIA, and Sebastian Schmalig, AIA, thought of it as a clean box, if not a clean slate.

"We thought about how to bring in light, take advantage of views, and connect the house to the outside—all the things you'd do when designing from scratch," Schmalig says. Reorganizing the interior added space and opened up the cellular floor plan, while three bigger moves judiciously accomplished the other goals. A new shed roof, supported by exposed metal and wood trusses, slopes up toward the north, inviting light deep into the interior through a long band of translucent, aerogel-filled polycarbonate glazing.

"Before the remodel, it was like a dungeon in here; now we don't have to turn on any lights during the day," Eric Edstrom says. "The roof design was an important eco-issue—how to use a translucent material across the front of the house without losing heating or cooling."

In fact, Schmalig says, the polycarbonate's  $\frac{7}{8}$ -inch aerogel cavity has an R-value of 7, compared to 2.6 to 3.5 for 1-inch-thick insulated low-E glazing. (Solutions such as these earned the home a 2010 AIA Housing Award, a recognition that is increasingly looking to honor ecological design.)

The facades are built for environmental performance. Walls with large windows were reframed using 2x6 studs, and the remaining walls were furred out to create a 5-inch cavity filled with spray-foam insulation. Attached to the sheathing is a VaproShield membrane that allows the house to breathe. A COR-TEN steel rainscreen, hung 1 inch from the membrane, wraps the house on three sides and eliminates heat and moisture buildup.

In these straitened times, Johnsen and Schmalig's approach offers a sensible alternative to the default response of tearing down and building bigger. "We were probably more involved in construction than on a new home because of not knowing what we'd encounter," Schmalig says. "But I don't think it's anything people should be afraid of." He estimates the owners saved about 25% in construction costs by using the existing house's bones.

"There's a sense of pride when you know you've saved something you easily could have torn down," he says. "You don't have to start from scratch to create something of value and artistic integrity." **AIA**

For more AIA news and resources, visit [ecohomemagazine.com/AIA](http://ecohomemagazine.com/AIA).

### PROJECT DETAILS

**Client:** Eric and J.J. Edstrom

**Name:** Ferrous House, Spring Prairie, Wis.

**Architect:** Johnsen Schmalig Architects, Milwaukee

**Design Solution:** Balance the salvageable structural bones with a set of well-thought-out spatial and material interventions.

**Size:** 1,450 square feet

**Cost:** \$250/square foot

**Date Started (design):** Spring 2006

**Date Completed:** January 2008



840

## PROJECT DETAILS

**Name:** Zero Energy Idea House, Bellevue, Wash.

**Size:** 1,630 square feet

**Cost:** Withheld

**Completed:** October 2009

**Certification:** 5 Star Built Green Seattle

**HERS Rating:** 53

**Builder:** Shirey Contracting, Issaquah, Wash.

**Architect:** Clinkston Brunner Architects, Seattle

**Landscape Architect:** Windrose Landscape Design, Seattle

**Structural Engineer:** Swenson Say Faget, Seattle

# Mixed Greens

PACIFIC NORTHWEST BUILDERS COMBINE VEGETATED SURFACES, SUPER INSULATION, CERTIFIED PRODUCTS, AND HIGHLY VISIBLE ALTERNATIVE ENERGY SYSTEMS IN THEIR ZERO-ENERGY DEMONSTRATION HOUSE.

When Washington builders Donna and Riley Shirey decided to build the Zero Energy Idea House in Bellevue, they were determined to create an educational “laboratory” that would demonstrate a wide range of green and sustainable possibilities.

“It was our chance to show how to build a high-performance house and create a real teaching tool,” says Donna about their decision to build the home that would push the envelope beyond what Shirey Construction had attempted in its more than 25 years building energy-efficient SIPs dwellings.

But before they could break ground and begin construction, the Shireys had to address a long list of issues related to the lakeside site. Along with a slope “so steep and overgrown you couldn’t see the bottom,” says architect David Clinkston, the property came under a new Critical Areas ordinance

that placed strict limitations on development impacts in environmentally sensitive areas.

The good news was the ordinance dovetailed with the project goals of demonstrating principles of low-impact development. The bad news was it required an extended team of experienced professionals—including several engineers, a land-use planner, two landscape architecture firms, and a wildlife biologist—three extra months and a consulting budget of \$75,000 to solve the problems. Among the challenges they faced: building a foundation on the 65% slope that required 14 tons of rebar and 200 cubic yards of concrete.

Next came the critical low-impact variable of erosion control. “We couldn’t just have water flowing down the slope—we had to manage it,” says Shirey. To that end, 18-inch-diameter compost socks—mesh tubes filled with composted material—were installed down the

## CASE STUDY ZERO ENERGY IDEA HOUSE



### SOLAR THERMAL

Kingspan Thermomax evacuated-tube solar collectors are up to 30% more efficient than flat-plate collectors and provide up to 70% of the home's domestic water heating demand. The collectors are certified by the Solar Rating and Certification Corp. 410.799.6600. [www.kingspansolar.com](http://www.kingspansolar.com). Circle 315.

### WIND TURBINE

The Helix S322 2.0-kW vertical-axis wind generator provides smooth power and torque delivery across a broad range of wind speeds and withstands difficult physical environments, the firm says. The generator produces usable power at 11.1 mph with optimum wind speed of 15.6 mph. The modular units are scalable; this unit is 10 feet, 10 inches tall with a 4-foot-by-8.66-foot rotor dimension. 877.246.4354. [www.helixwind.com](http://www.helixwind.com). Circle 316.

### SOLAR ELECTRIC

The 5.4-kW PV system, consisting of 24 SunPower SPR-225-BLK solar panels, is expected to generate an annual output of 4,119 kWh per year. The system also includes a SunPower SPR-6000m inverter and a SunPower Lifetime monitoring system. 408.240.5500. <http://us.sunpowercorp.com>. Circle 317.

### GREEN ROOF

The 1,000-square-foot vegetated roof consists of 2-foot-by-4-foot trays filled with growing medium and a selection of sedums chosen especially for the location and conditions. Rainwater harvesting uses a 3,000-gallon cistern located under the garage for irrigation of the site and the green roof. 800.488.0756. [www.triadassoc.com](http://www.triadassoc.com). Circle 318.



### COMPOST-FILLED LIVING WALL

The north side of the house features a living wall installed by Applied Organics. The structurally engineered installation combines compost with special netting for reinforcement. The addition of plants allows for an attractive alternative to a concrete or masonry retaining wall that also absorbs stormwater and produces oxygen. 425.844.9292. [www.appliedorganics.net](http://www.appliedorganics.net). Circle 319.

north side of the driveway to help retain sediment, and a 1,000-square-foot vegetated green roof was introduced to help reduce stormwater runoff. They also used downspouts to collect water for the cistern.

Having addressed the site logistics, the core team turned its attention to the plans for the 1,630-square-foot (conditioned space), 2-bedroom, 2.5-bath home. From the outset, all involved agreed that the exterior should exhibit as many green elements as possible. "We realized the site's busy traffic location on the Sammamish Parkway presented an opportunity to tell much of the story even to drivers just passing by on the highway," says Clinkston. "Things like the green roofs, a PV array, and a wind

generator are all visible from the road and immediately identify this as an advanced-technology green home."

Also visible is the metal grid around the front-entry vestibule, planted with vines that over time will grow to filter the afternoon sun and provide a shield from headlights at night.

That said, many of the home's most important efficiency features aren't immediately apparent, beginning with an R-22 Arxx ICF foundation.

The home's roof, walls, and lower floors were all built using SIPs. The 6-inch-thick wall panels deliver an R-value of 24; the 10 1/2-inch-thick floor and roof offer R-40.

High-performance Ultra fiberglass windows from Milgard feature

## SIPS

The floors, walls, and roof of the house were built with Insulspan SIPs, featuring expanded polystyrene foam sandwiched between two sheets of OSB. The R-24 wall panels were custom-made based on the project's house plans, including pre-cut window and door openings and pre-drilled electrical chases. 517.486.4844 [www.insulspan.com](http://www.insulspan.com). Circle 320.



## BATH TILE

Flux Studios' Fortis Arbor wood mosaic tiles are made using bamboo scraps and are assembled with low-VOC adhesives. The company also makes tiles from leftover teak and rosewood. 773.883.2030. [www.fluxstudios.com](http://www.fluxstudios.com). Circle 321.

double-pane low-E glass and were flashed with VaproShield's 3D to prevent moisture intrusion.

As part of their effort to get as close to net-zero as possible, the Shireys installed a 5.4-kW roof-mounted PV system made up of 24 SunPower modules, combined with a Helix 2.5-kW vertical-axis wind turbine; the jury is still out on the effectiveness of the turbine, given the short period of time it has been in operation.

The house features two hot water systems: A Unico UniChiller air-to-water heat pump delivers warm water for the Warmboard radiant floor system, and a Kingspan Thermomax evacuated-tube solar thermal system heats the domestic hot water supply, with a

Navien tankless as a backup.

Like the rest of the project, when it came to finish product selections, the team researched every detail, even visiting manufacturers to confirm their choices. Interior finishes include zero-VOC Sherwin-Williams paint, locally grown alder trim with a water-based finish, locally crafted Pacific Crest cabinets, recycled-content tiles and countertops, salvaged wood floors, Energy Star appliances, and CFL and LED lighting.

In addition to rainwater collection and native plants, other water-saving details include dual-flush Kohler toilets, low-flow bath faucets, and rainfall-monitoring irrigation equipment.

But no matter how many green products and technologies the house



## PROFILE:

## Donna Shirey

PRESIDENT  
SHIREY CONTRACTING

When Donna Shirey met her husband, Riley, their decision to marry also resulted in the creation of Shirey Contracting. It was 1982 and Donna, who had been working in the construction business for many years, was doing research about a growing trend called structural insulated panels (SIPs). "I wanted to bring something new to the company, so I brought SIPs," she says. "From the beginning, energy efficiency was part of our construction philosophy, and we have become leaders in the use of SIPs."

Twenty years later the same material that formed the foundation of their business provided the floor, walls, and ceiling for their most ambitious building project to date: the Zero Energy Idea House, a demonstration model of what they believe green can be.

No strangers to green construction (their Rosemary Beach Platinum house in Florida was the eighth LEED home in the country), the company has built a solid reputation for its sound environmental practices. Their commitment to green building ideals, earth-friendly materials, and jobsite recycling was so strong they gave it a name: Build Smart. "We approach every project as an opportunity to offer quality construction paired with environmental responsibility," she says.

As for the success of their current project, Shirey is happy to report that the energy efficiency hopes for the Zero Energy Idea House are being realized. "We just got back our first check from the public service company for \$324." —M.P.





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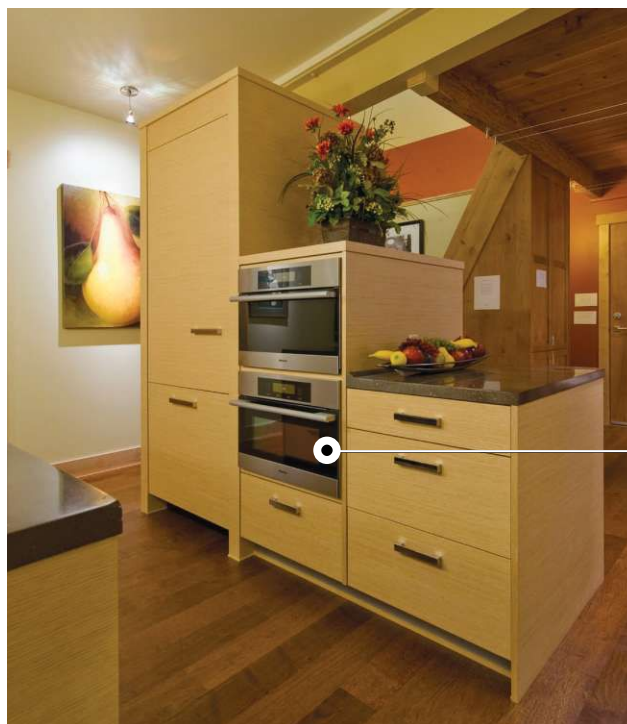


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## CASE STUDY ZERO ENERGY IDEA HOUSE

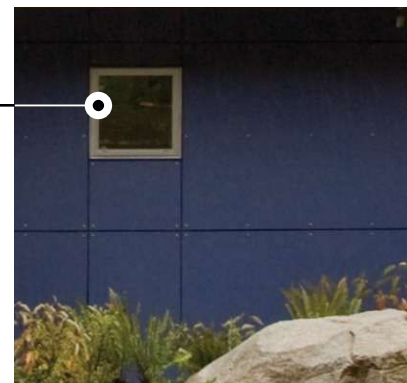


### APPLIANCES

The Miele G2470SCVi 24-inch Optima fully integrated dishwasher and KF18Vi-SS 30-inch bottom-mount refrigerator are Energy Star rated and feature a custom panel. Also included is the DG4082 convection/steam oven that allows homeowners to prepare multiple courses simultaneously, slow-cook, and reheat leftovers without drying. 800.640.2613. [www.miele.com](http://www.miele.com). Circle 322.

### WINDOW FLASHING

VaproFlashing, Factory Formed Corners, and VaproSillSaver are engineered to prevent moisture intrusion around windows and doors. 3D Factory Formed Corners are manufactured using a patented breathable membrane fabric with each corner formed using an ultra-sonic welding process; this eliminates weak joints compared to traditional heat welding, which can cause problematic leaking, says the firm. The flashing is pre-cut for easy installation. VaproSillSaver slopes  $\frac{1}{8}$  inch back to front to allow water runoff. The sills are compatible with most flashings and vinyl, wood, and aluminum windows and doors, and they are 100% recyclable. 866.731.7663. [www.vaproshield.com](http://www.vaproshield.com). Circle 323.



contains, much of its efficiency comes from basic design fundamentals. “Living with less square footage and a fairly rectangular floor plan also affects energy costs,” Clinkston says. “When you have lots of bumps and jogs in a house, it adds more exterior walls and more area for heat loss.”

The Shireys, who now live in the house, see the project as a culmination of the knowledge they have garnered over the years about sustainability and energy-efficient materials. And, in the spirit of the project, the couple have opened the house up to the public for tours and educational events to spread the word.

*Mindy Pantiel is a freelance writer in Boulder, Colo.*



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## PROJECT DETAILS

**Name:** The Lusche Residence, Auburn, Ala.

**Size:** 4,200 square feet

**Construction Cost:** \$188 per square foot

**Completed:** January 2009

**Certifications:** Green EnergyKey, Energy Star

**HERS Rating:** 61

**Architect:** Hinson + Dagg Architects, Auburn

**Builder:** Stewart Construction Co., Auburn



# Southern Comfort

TWO ALABAMA ARCHITECTS EMPLOY GENERATIONS-OLD SITING TECHNIQUES ALONG WITH STATE-OF-THE-ART ENERGY MODELING TO CREATE THIS MODERN, SUSTAINABLE TWIST ON A RURAL FARMHOUSE.

**T**he gently rolling tract of land in east-central Alabama was exactly what architects Christian Dagg and David Hinson's clients were looking for in a location for their new home: a serene, wooded spot that would require only minimal clearing, surrounded by fresh air and sunshine.

Expansive views were an added bonus—the 2.67-acre site sits on one of the highest points in Lee County, with a three-mile, southwest-facing vista. “We thought the gently sloping topography would give us the opportunity to arrange the geometry of the house so that the uphill, back view would have an intimate courtyard feel to it and the west-facing downhill side would have these fabulous long-distance views, which are not typical for sites in Alabama,” says Hinson.

Completed in early 2009, the 4,200-square-foot house pays homage to the area's rural roots by relying on centuries-old passive ventilation techniques. Like nearby farmhouses and rural outbuildings with no air conditioning systems, the narrow dwelling is positioned to capture east-west breezes to reduce its reliance on mechanical cooling.

“We live in a region of the country where we have a fabulous spring and fall, and if you have a home designed to passively ventilate you can turn off the air conditioning and have a wonderfully comfortable home,” explains Hinson.

Its simple exterior materials and forms, such as galvanized metal roofing, gables, and white wood-look siding, also provide a nod to Southern vernacular. “We were both really keen on the notion of designing the house in a way that reflects the history and feel of the region,” Hinson says.

PHOTO: CHRIS HAMILTON

## CASE STUDY

### ALABAMA CUSTOM HOME



#### ROOF

Light-colored Union Corrugating Advantage-Lok galvanized metal on the lower roof and white composition shingles from Atlas Roofing on the upper act as radiant barriers to keep the house cool even during scorching southern summers. Union Corrugating: 888.685.7663. [www.unioncorrugating.com](http://www.unioncorrugating.com). Circle 332. Atlas Roofing: 800.478.0258. [www.atlasroofing.com](http://www.atlasroofing.com). Circle 333.

#### WINDOWS

Deep roof overhangs and low-E double-glazed aluminum-clad Lincoln Windows helped yield a 25% load reduction on the HVAC system, Hinson says. The Energy Star-rated windows have an average solar heat gain coefficient of 0.29 and an average U-factor of 0.36. 715.536.2461. [www.lincolnwindows.com](http://www.lincolnwindows.com). Circle 334.

#### SIDING

To deflect heat and to mimic the look of nearby wood-sided barns and outbuildings, the architects spec'd white HardiePlank fiber-cement lap siding with the new HardieZone system that provides climate-specific performance attributes based on a project's location. For the stone accents, they chose Owens Corning's Cultured Stone, which contains 35% recycled pre-consumer waste and is certified to Greenguard's Children & Schools standard. James Hardie: 888.542.7343. [www.jameshardie.com](http://www.jameshardie.com). Circle 330. Owens Corning: 800.255.1727. [www.culturedstone.com](http://www.culturedstone.com). Circle 331.

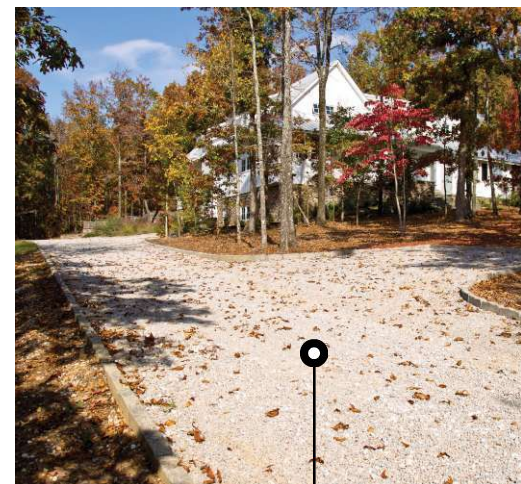
The duo's first move was to lay out a simple L-shaped configuration and arrange the home's major elements into two slender wings joined at the southwest axis, allowing for optimal cross ventilation while taking full advantage of the views.

Four bedrooms, the dining room, the kitchen, and the breakfast area are stacked in a two-level bar that faces west. The south-facing leg contains the social spaces, including the front porch and gallery, living room, and screened porch, and is lined with generous-sized low-E windows shaded by 36-inch overhangs to let in ample—but not too much—daylighting.

Orientation and careful planning were key elements in reaching sustainability goals for the Lusche residence,

which was the first home to achieve the highest level of certification in the Home Builders Association of Alabama's EnergyKey rating system, developed in 2006 in partnership with Southface Energy Institute. The project focused heavily on energy efficiency, a crucial component of EnergyKey certification.

During the design phase, the architects' San Antonio, Texas-based energy modeler ran several computer-generated programs using REM Rate software from Architectural Energy Corp. that showed the team how various insulation strategies, wall assembly decisions, and other building volume details would affect projected HVAC loads. The results of the \$2,500 modeling convinced them to use open-cell spray-foam insulation,



#### LANDSCAPING

Heavy tree cover from red oaks, white oaks, and dogwoods help to keep the house naturally cool. The landscaping, which is more than 50% shaded, includes a rain garden on the north side to capture runoff from the courtyard. In addition, the 300-foot-long driveway is made of pervious gravel instead of pavement.



## INTERIORS

Hinson and Dagg kept interiors clean and simple, opting for red oak floors and painted MDF trim. Benjamin Moore's low-VOC Aura interior paint features the company's ColorLock technology, which allows the paint to cover most surfaces in one coat, and never more than two coats, says the firm. It has been certified to Greenguard standards for Low Emitting Products and for Children & Schools. It is available in matte, eggshell, and satin finishes. 800.344.0400. [www.myaupaint.com](http://www.myaupaint.com). Circle 335.

seal wood-to-wood wall connections within the framing, spec a 16-SEER Trane heat pump, and move the insulation line from the ceiling to the roof plane so that all ductwork would be in conditioned space.

With the ultra-insulated shell and fine-tuned heating and cooling load, Hinson and Dagg were able to right-size the HVAC equipment, reducing the spec by almost 6 tons, saving more than \$20,000 in system costs. "The reduction in the mechanical system size paid for the energy modeling many times over," says Hinson, noting that they'll do the same for all their future projects.

Due to the increased tightness of the exterior envelope, the architects included an Alpine ERV system with

## KITCHEN

The kitchen includes a low-flow Grohe faucet and an Energy Star-rated Bosch dishwasher with sensors that determine a load's soil level and delete fresh water fills if they're not needed, cutting energy usage by up to 20%, the company says. Grohe: 630.582.7711. [www.groheamerica.com](http://www.groheamerica.com). Circle 336. Bosch: 800.944.2904. [www.bosch-home.com/us](http://www.bosch-home.com/us). Circle 337.

Honeywell fresh air dampers to ensure adequate fresh air intake when the windows are closed. Other energy-saving features include light-colored metal and fiberglass composite roofs; R-5 insulated foundation walls; Energy Star-rated appliances, bath fans, and light fixtures; and two high-efficiency electric water heaters.

WaterSense-labeled toilets and faucets help reduce water usage inside, while the site design—which preserved 96% of the property's hardwoods, minimizes rainwater runoff, and utilizes native plant species with low water requirements—conserves water outside.

"Compared to a typical Alabama custom home, we have a postage-stamp-size sod area—less than 2,000 square feet," Hinson explains.

## PROFILE:

### Christian Dagg & David Hinson

PRINCIPALS

HINSON + DAGG ARCHITECTS

Christian Dagg (below, left) and David Hinson (below, right) met 10 years ago at their day jobs teaching architecture at Auburn University. They shared an interest in sustainable design, and in 2002 helped students plan and build the first Energy Star Habitat for Humanity dwelling in Alabama. In 2005 they opened their own design firm, while continuing their faculty positions at the school.

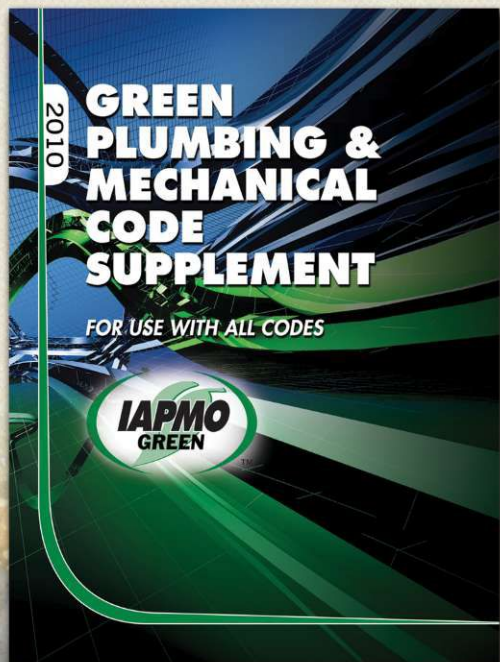
When the Lusche project came along, the duo jumped at the chance to work with eco-minded clients on a third party-certified house, a first for both. "As architectural educators it was a natural segue to apply what we do in school to what we do in practice," Hinson says.

And now that the house is complete, it has become a teaching tool. Dagg and Hinson use it in their classes as an example of sustainable architecture and have presented it to builders, architects, and colleagues at HBA meetings and a regional Habitat for Humanity conference. The biggest take-away message for fledgling architects: Learn how to evaluate the performance of a building beyond how it looks, says Dagg.

The professors also strive to provide hope to their eco-minded protégés as they prepare to enter a hostile job market. "Everywhere in the country, home building is dramatically down, and because of that the green building movement has lost some momentum," admits Hinson. "But at the same time I think the economy has reframed decisions that homeowners make about the operating costs of their houses, and as the market recovers, homeowners are going to be pressuring their architects and builders to come up with even greener homes." —J.G.



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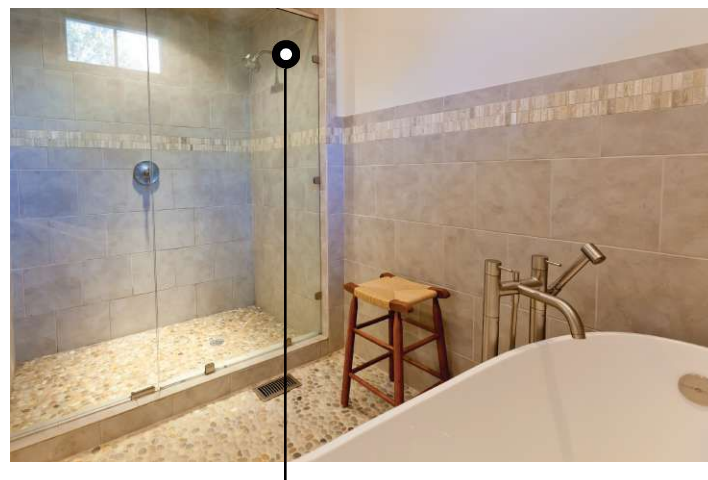
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## CASE STUDY

### ALABAMA CUSTOM HOME



#### BATHROOM

Aquabrax low-flow showerheads and Kohler WaterSense-labeled toilets help conserve water. The 1.28-gpf Cimmaron units feature the company's Class Five flushing technology and will provide water savings of up to 16,500 gallons a year each compared to a traditional toilet, the maker says. Aquabrax: 514.381.4141. [www.aquabrax.com](http://www.aquabrax.com). Circle 338. Kohler: 800.456.4537. [www.kohler.com](http://www.kohler.com). Circle 339.



#### WATER HEATERS

Installed in the garage, the home's two 50-gallon Marathon electric water heaters boast an Energy Factor of 0.94. The units' 2½-inch-thick CFC- and HCFC-free Envirofoam insulation minimizes heat loss and the non-metallic inner tank of seamless blow-molded polybutylene and the filament-wound fiberglass outer tank provide maximum strength and long-lasting durability, the company says. 800.321.6718. [www.marathonheaters.com](http://www.marathonheaters.com). Circle 340.

Still, building a third party-certified house in a rural area with no statewide energy code and few green raters, verifiers, or eco-minded subcontractors proved challenging. The architects, both professors at nearby Auburn University's College of Architecture, Design and Construction, fell back on their years of experience as green educators and advocates in seeing the project to completion.

"This isn't Seattle; we're on the frontier of the residential green building movement here," says Hinson. "We've had to do a lot of convincing to get these ideas out there into the housing marketplace."

*Jennifer Goodman is managing editor of EcoHOME.*



For more case studies,  
visit [ecohomemagazine.com](http://ecohomemagazine.com).

PHOTOS: CHRIS HAMILTON

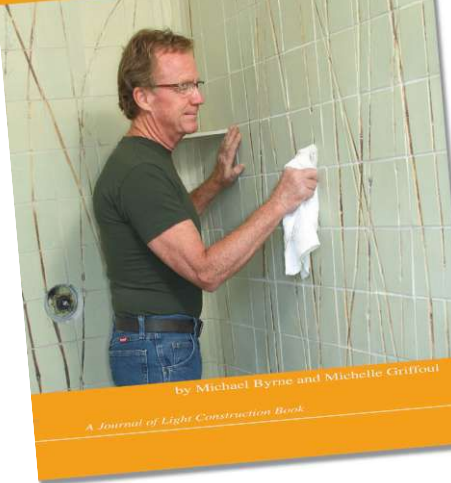
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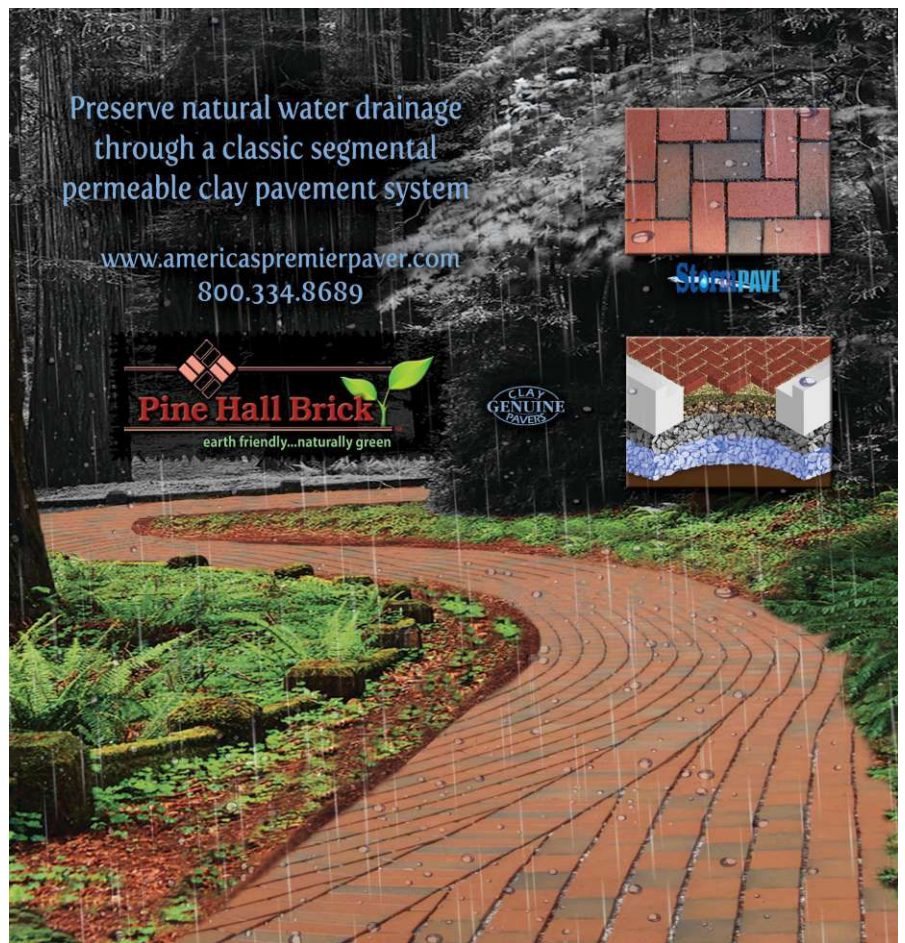
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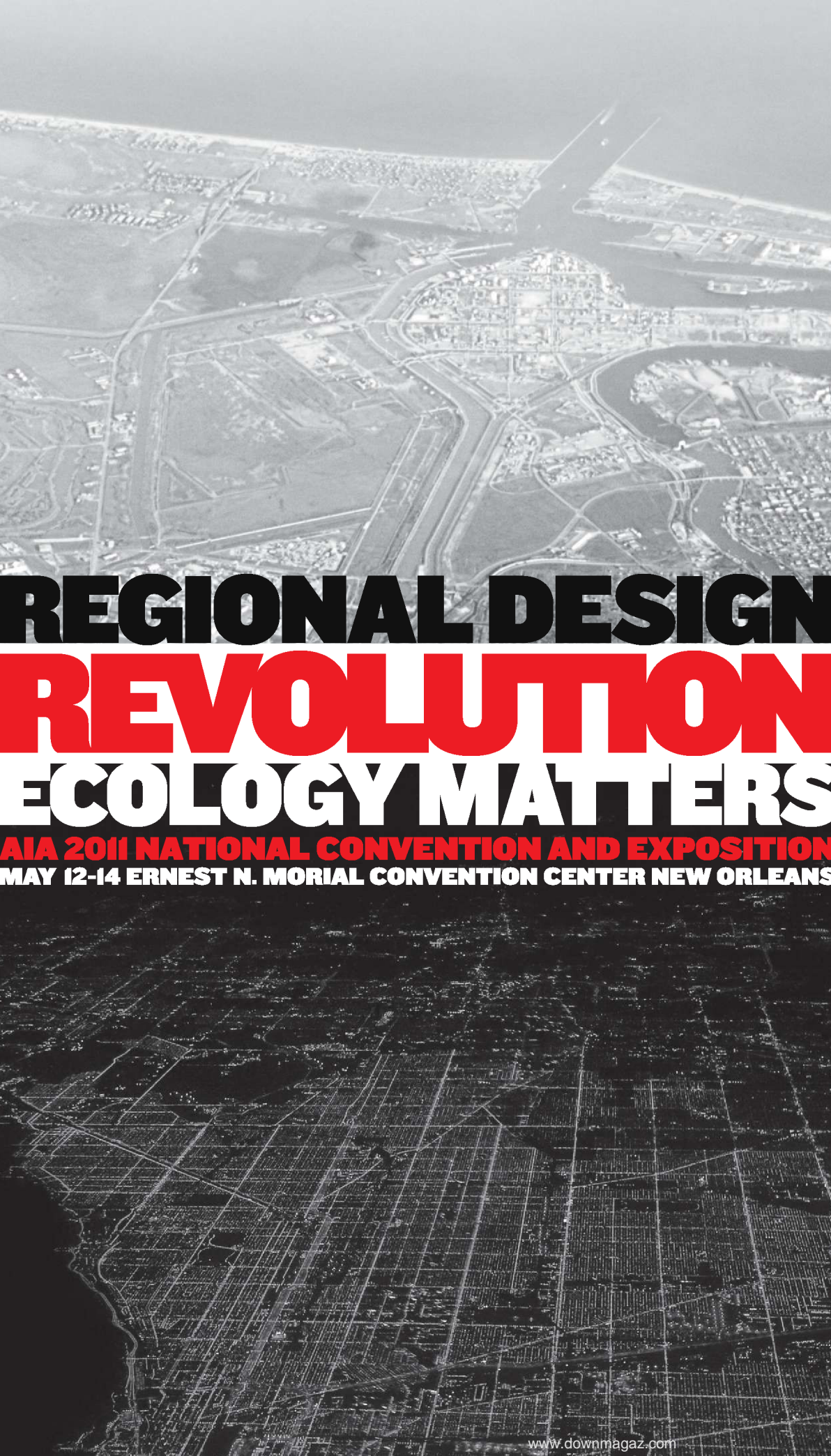
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# THINK TANK

Although tankless water heaters have gotten a lot of attention the last few years, tank-style units offer plenty of efficient options, and in some cases, are actually more efficient.

By Lisa Bonnema

There's no arguing that tankless has become a buzzword among the green community, and it might be tempting to blindly jump on the bandwagon. But don't discount tank-style water heaters too quickly. Advancements in both electric and gas storage water heaters are offering leaps in efficiency that are putting tank water heaters back on the green radar.

## PUMPED UP EFFICIENCY

Perhaps one of the greatest advancements has been the integration of HVAC heat-pump technology into electric tank water heaters. The combination of the

**GE.** With an Energy Factor of 2.3, the GeoSpring heat-pump water heater exceeds current Energy Star requirements and consumes 62% less energy than standard electric water heaters, the maker says. The unit features a backlit LCD display that allows homeowners to choose from four different modes to adjust to changing hot water needs. A vacation setting drops the system's temperature set point to 50 degrees F to save energy, while also preventing the water from freezing. 800.626.2005. [www.geappliances.com](http://www.geappliances.com). Circle 380.

## product review | TANK-TYPE WATER HEATERS

➤ **HTP.** The Everlast electric water heater is designed to be an efficient solution for point-of-use applications such as kitchen sinks. A specially designed cold-water connection allows the unit to achieve long draws of hot water without consuming large amounts of energy. The connection directs cold water to the heating element near the bottom of the tank, minimizing the mixing of cold and hot water. The stainless steel tank is available in three sizes: 6, 12, and 20 gallons. 800.323.9651. [www.htproducts.com](http://www.htproducts.com). Circle 381.



two technologies can produce efficiency ratings as high as 2.3 EF (Energy Factor), compared to the current minimum efficiency rating for a 60-gallon water heater at 0.89 EF, making them one of the most efficient water heating options available.

Often referred to as “hybrids,” these units are more than twice as efficient as standard electric water heaters and cost less than half the amount of money to operate. By using an Energy Star-rated heat-pump model, the DOE estimates that the average household can save almost \$300 per year compared to a standard electric water heater. The units do cost more up front (about \$1,200–\$1,800), but the payback period is estimated to be only three years. They also can earn three points toward LEED certification, versus two for an electric tankless unit out of a total of six points available for water heating. The National Green Building Standard (NGBS) awards 7 points for heat pump units with a 1.5 EF and a maximum 10 points for 2.0-EF models.

A heat-pump water heater operates like a heat-pump HVAC system, borrowing heat from the atmosphere. An evaporator inside the tank uses refrigerant to absorb heat from the surrounding air and transfers it to a heat exchanger that heats the water inside the tank. Cool air is then expelled into the atmosphere. The tank includes electric heating elements to provide back-up heating if necessary.

The general layout of the appliance is similar to a conventional electric water heater, but there are some installation considerations. The integrated heat pump makes the tank a little taller than standard tank water heaters, and they require a condensate drain connection.

The biggest consideration, however, is that heat-pump water heaters require a whopping 1,000 cubic feet of ambient air to operate. Also, because the heat pump borrows heat from the surrounding air, homes in colder climates may require the unit to be installed in a conditioned space, and as a result, may not save as much energy. Basically, homeowners would be paying for another appliance to replace the heat being used by the heat pump—a fact that isn’t taken into consideration in efficiency ratings. At the same time, this means the unit may actually help the AC during warmer months.

◀ **A.O. SMITH.** The Next Hybrid gas water heater combines tank and tankless water heating technologies to operate at 90% thermal efficiency. The unit performs like a tankless model, but a small buffer tank allows it to overcome some of the negative attributes normally associated with tankless models such as minimum flow rates. To maximize the system’s energy efficiency, the exhaust gas from the tankless engine is routed back into the buffer tank to extract additional heat into the water. 866.362.9898. [www.hotwater.com](http://www.hotwater.com). Circle 382.



➤ **BURNHAM.** The Alliance SL indirect-fired water heater is a tank-style option for builders who want to greatly reduce standby losses. Instead of using a flue, the indirect-fired water heater utilizes the power and large heating capacity of a boiler to provide hot water. The unit also features 2 to 3 inches of polyurethane foam insulation and a hydrastone lining to further reduce standby heat loss. 717.397.4701. [www.burnham.com](http://www.burnham.com). Circle 383.



◀ **BRADFORD WHITE.** The Eco-Defender Safety System Ultra-Low-NOx series water heater is said to emit 75% less NOx emissions than standard gas tank water heaters. A primary-air radiant burner features a super alloy radiant flame holder that assists in the overall reduction of NOx emissions. The flame holder’s mesh material is said to have superior resistance to oxidation and corrosion, and a stainless steel diffuser evenly distributes the air/gas mixture across the flame holder. In this line, the U4TW models are Energy Star rated. 800.523.2931. [www.bradfordwhite.com](http://www.bradfordwhite.com). Circle 384.



## FUELING OPTIONS

Generally, heat pumps are the most efficient tank-type choice for homes that don't have access to natural gas. However, builders can still earn one LEED point or one NGBS point by installing a high-efficiency electric tank model. This includes 80-gallon units rated at 0.89 EF or higher, 50-gallon units at 0.92 EF or higher, or 40-gallon units at 0.93 EF or higher. Electric tank models are not covered under Energy Star, so check efficiency ratings closely. Builders may want to look for an electric water heater that has been certified by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) to ensure that the manufacturer's high-efficiency claims are valid.

For areas where natural gas is more cost effective than electricity, builders may want to consider using a gas condensing tank-style water heater. Residential models are still in development, but some manufacturers have been marketing their commercial units for residential use, with some condensing models claiming thermal efficiencies of up to 96%—higher than even tankless, which are rated at about 80% thermal efficiency.

The general operating principles of a condensing model are similar to a standard tank water heater, but with better heat exchange. Instead of venting combustion gases outside like a standard gas tank water heater, a condensing model uses those gases to heat the water. The flue in these models also has been redesigned with a greater surface area so that the heat and combustion gases have a longer distance to travel, and, therefore, heat the water more efficiently. Basically, the tank heats up almost as quickly as it's filled and can provide more continuous hot water, overcoming one of the usage drawbacks of conventional storage water heaters.

Like condensing furnaces, condensing water heaters produce condensation as a by-product of the combustion process, which means builders will need to install a condensation drain. Also, they require electricity and PVC pipe to accommodate the power venting.

Because current models aren't rated as residential units, builders should know that they don't have to meet FVIR or low-NOx requirements; however, as of press time, residential units were expected to launch by the



**▲ RHEEM.** The new Fury series gas water heater is one of the first atmospheric models to meet the latest Energy Star requirements of 0.67 EF. The unit uses a 24-volt powered damper to close off the flue, which helps retain the heat in the unit rather than letting it escape up the chimney. The units are available in three storage capacities in both tall and short models, and ultra-low-NOx models are also available. 800.621.5622. [www.rheem.com](http://www.rheem.com). Circle 385.

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▲ **KENMORE.** The Elite Energy Star gas water heater achieves a 0.70 EF rating thanks to a patented air intake system. Much like a turbo charger, air is pushed into the combustion chamber and creates a pressurized environment. As a result of the pressurization, tighter baffling can be incorporated into the flue design to slow down the hot gas as it travels through the water heater. More heat is transferred to the water, and less energy is wasted. Both 40- and 50-gallon units are available. 888.536.6673. [www.kenmore.com](http://www.kenmore.com). Circle 386.

end of 2010. Once available, the DOE estimates that homeowners can cut water heating energy use by 30% versus standard gas storage models and greatly reduce greenhouse emissions by taking about 75 therms off their natural gas bill. Installing gas-condensing models can earn two LEED points. And while the NGBS does not specifically mention condensing models yet, gas-fired units operating with an EF of 0.80 and higher are generally eligible to earn 10 points.

Conventional gas tank water heaters also are getting more efficient. In September, Energy Star upped its energy rating requirements for gas tank units from 0.62 EF to 0.67 EF. To meet those levels, manufacturers have to add power to their units, which is why most high-efficiency models are power vented or power direct vented. While these units are easily installed in new homes, they do require additional work in remodeling because the venting system needs to be replaced with PVC. There are a few innovative atmospheric models on the market that are Energy Star rated, but keep in mind that most standard atmospheric models are unable to reach anything above 0.63 EF. Even so, 40-gallon gas tank units with an EF of 0.61 or above will still provide one LEED point, and 60-gallon and 80-gallon models only need to reach 0.57 EF and 0.53 EF, respectively, to earn one LEED point.

Another detail to look for on gas water heaters is emissions. While only California has ultra-low NOx requirements (emission levels of less than or equal to 10 nanograms of nitrogen oxides per joule of heat output), some manufacturers are finding a cost benefit in manufacturing several of their units at low NOx rates. There are also several propane-fueled (LP) models available for builders who don't have access to natural gas. The Propane Education & Research Council claims that LP water heaters are a greener option compared to electric water heaters. "Even though there aren't any emissions from an electric water heater at the home site, there is a lot of coal being burned to make that electricity," says Tom Jaenicke, energy advisor to the council.

#### SETTING A NEW STANDARD

While tank-style units have certainly come a long way, they do have their limitations. When not in use, they produce standby



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▲ **STIEBEL ELTRON.** The Accelera 300 heat-pump water heater offers 80 gallons of hot water storage with an Energy Factor of 2.5 and a first-hour rating of 78 gallons. The Energy Star-labeled unit is designed with the condenser wrapping the outside of the tank (rather than pumping the water through the heat pump), which is said to reduce the amount of electric power needed and improves overall energy efficiency. 800.582.8423. [www.stiebel-eltron-usa.com](http://www.stiebel-eltron-usa.com). Circle 387.

losses, and, of course, they can run out of hot water. Tankless models address both of those issues, but they offer their own set of drawbacks. Tankless units have a longer payback period (15 to 20 years), and they don't have stored capacity for high-demand periods. They also have minimum and maximum flow rates, which is especially challenging as more green homes adopt low-flow faucets and shower fixtures.

With shortcomings on both sides, it's easy to see why manufacturers are now starting to come out with a new form of hybrid: tankless units with small storage tanks. They operate like a tankless unit, but a small buffer tank allows them to overcome some of the negative attributes normally associated with tankless models like minimum flow rates or "cold water sandwiches." By capitalizing on the strengths of both tankless and storage water heaters, these units can reach efficiencies of up to 90%. However, because they represent a new water heater category, they do not yet qualify for Energy Star, LEED, or NGBS points.

Needless to say, this is an exciting time for the water heater industry. Innovation is at its peak and doesn't show signs of leveling off anytime soon. A new federal rulemaking has required that as of April 16, 2015, newly built electric tank models with volumes of 55 gallons or greater achieve an EF of 2.05—an efficiency level that isn't possible without heat-pump technology. Similarly, the ruling calls for gas tank models with volumes of 55 gallons or greater to have an EF of 0.8012, which requires gas-condensing technology. "The 2015 standards will change the way people look at large water heaters above 55 gallons," notes Tommy Olsen, a senior product manager at Rheem.

While meeting the new standards will certainly require a lot of work on behalf of manufacturers, it's good news for contractors. With a vast array of greener water heating options—including solar thermal—specifiers no longer have to rely on trends, but instead can choose a high-efficiency model that truly fits their needs.

*Lisa Bonnema is a freelance writer in Mokena, Ill.*

✱ For more green products, visit [ecohomemagazine.com](http://ecohomemagazine.com).

10

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# TAKING SIDES

There's no shortage of cladding options for green homes. Here's what to weigh when making your selections. By Katy Tomasulo

**L**ike many building product categories, choosing siding for a green-built home is far from cut-and-dried. Among mainstream cladding materials, each product comes with its own set of features and benefits, both from a sustainability perspective and from the attributes of price, installation, appropriateness for climate, and aesthetics. As such, while certain products have emerged as leaders in the green-building industry, no option is perfect. Perhaps this is to be expected, considering we rely on cladding materials to protect homes from the worst Mother Nature can throw at them—and still look good doing it.

"There is no silver bullet," confirms Vladimir Kochkin, division director at the NAHB Research Center. "And that's true for almost any product or material."

Unfortunately, there's also no category-wide certification program to use as an overall guide, although some manufacturers have obtained third-party verifications for attributes like recycled content and air quality. And most claddings qualify for points under LEED for Homes and the National Green Building Standard.

The first decision for choosing a siding material must come down to what's suitable for and allowable in your market and location. Following

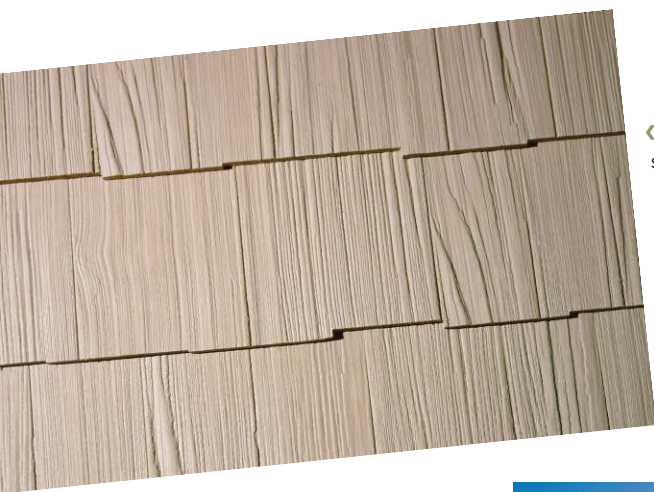
that, here's a breakdown of how the major types of residential cladding compare on common attributes for green-built homes.

## FIBER CEMENT

Fiber cement has become a go-to product for many green builders, who appreciate its durability and a look that replicates wood but with lower maintenance. Made with cement, sand, and cellulose fiber, the non-combustible material is resistant to rot and termites, according to ToolBase, carries warranties as long as 50 years, and costs less than wood and stucco.

"What [builders like] first is the durability,"

**CALSTAR.** Made with fly ash, water, and sand and manufactured with a vibro-compaction process and cured for less time and at a lower temperature, CalStar bricks generate 85% less CO<sub>2</sub> and use 85% less energy in production than traditional fired clay, the company says. The bricks incorporate 40% recycled content. A range of colors is available. 510.793.9500. [www.calstarproducts.com](http://www.calstarproducts.com). Circle 390.



◀ **COLLINS.** TruWood engineered wood siding comes in a range of styles, including ½-inch Cottage Lap, ½-inch panel, and ½-inch cedar shake lap. The product is SCS certified for a minimum of 25% recycled content and is available FSC certified. It is designed to eliminate splitting, cracking, and checking, the company says, and comes pre-primed. 800.329.1219. [www.collinsco.com](http://www.collinsco.com). Circle 391.

▶ **WESTERN RED CEDAR LUMBER ASSOCIATION.**

Available in a range of patterns and grades, Western red cedar is naturally resistant to decay and insects and can be left untreated for a natural patina or painted or stained. Wood from SFI-, FSC-, and CSA-certified forests can be specified. The product is stable and will remain straight and lie flat. 866.778.9096. [www.wrcla.org](http://www.wrcla.org). Circle 392.



◀ **CERTAINTEED.** The company's CedarBoards D6 insulated vinyl siding is made with 60% recycled content that includes post-consumer vinyl siding. The foam backing boosts a wall's R-value, enabling an Energy Star rating for the panels, and provides rigidity and impact resistance. The TrueTexture rough cedar finish is molded from real cedar boards. Eighteen colors are available. 800.233.8990. [www.certainteed.com](http://www.certainteed.com). Circle 393.

▶ **BORAL BRICKS.** The company's bricks are made with clay and shale and are manufactured near the source. Options include traditional face brick in a range of colors and 17th Century Brick, which is formed in a handcrafted, sand-dusted wooden mold so that no two are exactly alike. Shown here is Indian River face brick. 800.526.7255. [www.boralbricks.com](http://www.boralbricks.com). Circle 394.



says Prashant Panchal, director of marketing for James Hardie. "Secondly, it's what the product is made of ... None of these elements are toxic."

One environmental drawback to fiber cement is its high embodied energy during manufacture. Our friends at *Environmental Building News* also caution that some of the cellulose content may come long distances, so be sure to get documentation on origins.

Fiber-cement planks with recycled content in the form of fly ash are available, such as those from CertainTeed. And though fly ash has recently come under the EPA's microscope for concerns over hazards in disposal, "beneficial reuse" applications—such as encapsulated in concrete or brick—are exempt.

Because of silica dust, installers should cut outdoors and wear a respirator. Upon tear-down, fiber cement can't be remanufactured, but it can be ground up for use as fill.

Manufacturers and green experts recommend pre-finishing, which provides an emissions-controlled environment; it also better ensures a quality application and may be required for some warranties.

## WOOD

Many consider wood the ultimate sustainable material and renewable resource, and therefore one of the greenest cladding choices. Its long history as an exterior finish has established a built-in appeal to many buyers that can boost resale values.

Western red cedar, which comes to mind first for many, is naturally durable and, with proper maintenance, a long-lasting option. According to Paul Mackie, western field manager for the Western Red Cedar Lumber Association (WRCLA), cedar also is lightweight in transport.

In separate third-party life-cycle assessments (LCAs) conducted by the WRCLA and the Vinyl Siding Institute, cedar finished ahead of all cladding in both studies—fiber cement, vinyl, and brick or brick and stucco. In the WRCLA study, cedar received top marks in five of the seven criteria; the two categories in which it didn't perform as well—smog and eutrophication—the WRCLA attributes to paint, noting that higher-quality paints and

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► **LP.** The SFI-certified trees (primarily aspen) used to manufacture SmartSide engineered wood siding are small and readily renewable, the maker says, harvested every seven to 10 years. The entire tree is used in manufacture, with the bark used to power the plant. SmartSide is bound with a low-emitting, urea formaldehyde-free MDI resin and is treated with EPA-registered zinc borate. It comes pre-primed and can be pre-finished or finished on site. 888.820.0325. [www.lpcorp.com](http://www.lpcorp.com). Circle 395.



◀ **JAMES HARDIE.** The re-engineered HardieShingle fiber-cement siding line offers an authentic-looking wood-grain appearance in a straight-edge panel, a staggered-edge panel, and individual shingles in five widths. The siding is available primed or with ColorPlus pre-finishing. Under the company's HardieZone system, each panel is engineered to meet the needs of the region in which it is installed. 888.542.7343. [www.jameshardie.com](http://www.jameshardie.com). Circle 396.

► **ELDORADO STONE.** Made with cement with lightweight aggregates, the company's manufactured stone is lighter weight and lower cost than natural stone and has a lower waste factor. Color is provided by natural iron oxides. Some of the products contain recycled content in the form of fly ash. They have an average R-value of 0.41 per inch. A range of regional and national profiles is available; Cut Coarse Stone is shown here. 800.925.1491. [www.eldoradostone.com](http://www.eldoradostone.com). Circle 397.



◀ **ECOSTUCCO.** Made with limestone, EcoStucco requires about 40% less CO<sub>2</sub> to produce than Portland cement-based stucco, the manufacturer says. The lime plaster can be used with most substrates, including blue board, concrete, and masonry. The product comes in 216 standard colors made with natural pigments and five textures. 415.455.9896. [www.ecostucco.com](http://www.ecostucco.com). Circle 398.

stains or new waterborne products are one way to help offset this.

Cedar siding is resistant to moisture and insects and doesn't have to be treated; left unstained, it will develop a patina and will need to be cleaned with a mild oxygen bleach solution. To retain its original color, staining and maintenance will be required. Prefinished products are often available.

Still, with cost premiums and annual limits on availability, cedar isn't always a feasible choice. What's more, supplying materials outside the Pacific Northwest means shipping long distances.

Among the other wood options are redwood, cypress, Eastern white cedar, Douglas fir, and pine. For the most sustainable selections, look for local sources and products with third-party certifications such as FSC, SFI, and CSA.

Phil Kaplan, AIA, principal at Kaplan Thompson Architects in Portland, Maine, uses locally sourced Eastern white cedar or white pine for some of his projects (along with fiber cement and metal). The cedar does not require treatment (although it can be stained or painted); without treatment, the color starts uneven, but evens out over time, Kaplan says. Pine is a less expensive option, but does require treatment.

Builder Michael Chandler has found tulip poplar an affordable, extremely local option in his North Carolina market. He also has utilized BarkHouse siding, in which the bark of trees bound for furniture manufacturing is stripped and crafted into shingles.

Resource-efficient engineered products also are available; be sure to research the chemical content of binders, treatments, and finishes.

## VINYL

Vinyl is by far the most hotly debated cladding material among green building professionals, caught between its detractors and its defenders. On the one hand, vinyl siding is often selected for its affordability, low maintenance, and durability, with a 40- to 50-year life expectancy. And it is lightweight in transport. On the other hand, it's made from PVC, an ingredient many green advocates question.

According to vinyl siding advocates, next to its durability, vinyl's key environmental

attribute is its ultimate recyclability. “Vinyl siding can be recycled into vinyl siding many times,” says Tad Radzinski, president of design and development firm Sustainable Solutions and a consultant to the Vinyl Siding Institute (VSI). After teardown, vinyl siding can be remanufactured, with no separation required between manufacturers. Though no significant national reclamation program exists yet, some companies (CertainTeed, for example) are beginning to implement programs.

In the life-cycle assessment the Vinyl Siding Institute commissioned Sustainable Solutions to conduct using BEES, vinyl performed better than brick and stucco, although it finished after cedar (the LCA did not include fiber cement because that data was not available in BEES at that time). A life-cycle assessment performed by a third party for the Western Red Cedar Lumber Association, which did include fiber cement, found similar results and also ranked vinyl ahead of fiber cement.

The chief concern about vinyl siding within green building circles and among health advocates centers on PVC’s chemical makeup. The Healthy Building Network, for example, labels PVC an “environmental health disaster” and states that PVC poses hazards in manufacturing, its life, and disposal, and releases gases and dioxins if burned by accident or as waste. And the Living Building Challenge, seen as the country’s most stringent green building certification program, includes PVC in its “Red List,” making it one of 14 product ingredients restricted from use.

Jerry Huntley, president and CEO of the VSI, says that once the siding is manufactured, the chlorine is locked into the product more tightly than when it was salt. “Vinyl siding is safe,” she asserts. “It does not release chemicals into the atmosphere. The products of vinyl combustion are no more hazardous than those produced by burning many other common materials, both synthetic and natural.”

Huntley says the LCA shows vinyl having lower environmental impacts compared to many other exterior claddings, including lower levels of toxic chemicals released into the environment. “Vinyl siding does not off-gas or emit chemicals during its lifetime,” she says. “During its lifetime, it doesn’t require painting, staining, or caulking. This further reduces

emissions over the life cycle that could occur from the release of harmful solvents and other VOCs into the environment from painting and staining.”

The latest trend within the category has been the introduction of insulated panels, which have a layer of EPS foam adhered to the back. The foam reduces thermal bridging and, according to the NAHB Research Center, can add an additional R-value of up to 4.5. The backing also adds rigidity and impact resistance.

The foam backing does bring another virgin material to the manufacturing process, but it can be recycled upon teardown after it’s separated from the vinyl panel.

VSI offers a certification program that independently verifies that products meet or exceed the industry standard for quality, ASTM D3679, which covers impact, thickness, and weatherability; it was recently upgraded to require no lead or cadmium content after some products were imported with those elements.

## BRICK

Like wood, brick attracts home buyers for its aesthetic, low maintenance, and resale value.

Clay brick, which makes up 90% to 95% of the market, says Shelley Ross, director of marketing at Boral Bricks, combines the natural materials of clay, shale, and water. Raw material extraction, manufacturing, and distribution are commonly very local. In most cases, she says, the clay is mined within a mile or two of the brick plant and then sold locally, an important consideration because the material is heavy in transport.

Brick is fired at 2,000 degrees F for several days, equating to high embodied energy in manufacture. Still, manufacturers argue that brick’s long life—with expectancies of 100 to 200 years or more—makes up for the energy used in manufacturing. It’s also durable, impervious to rot and mold, and requires no painting or staining and little maintenance.

And new options are emerging. CalStar, for example, offers bricks in which fly ash, water, and sand are vibro-compacted and then cured at lower temperatures and for less time than traditional brick.

Upon teardown, bricks typically can be re-sold and re-used. They also can be



➤ **TAPCO.** Foundry vinyl cedar shake siding features a rough-sawn look and staggered butt ends and varied widths for a cedar appearance. It comes in 7- and 10-inch exposures and is available with Fullback, a foam backer that adds a 3.96 R-value. The company participates in EcoScorecard, which allows contractors to see how products qualify under green project rating systems. 800.771.4486. [www.foundrysiding.com](http://www.foundrysiding.com). Circle 399.



➤ **STO.** Comprised of StoGuard spray-on waterproofing/air barrier, adhesive, and StoTherm EIFS, StoTherm NExT provides a complete wall system of physically and chemically compatible components. The StoGuard continuous air and moisture barrier is seamless and durable, the maker says, and resists moisture penetration more than five times longer than traditional housewraps. The EIFS consist of a base coat with 17% recycled content, embedded glass-fiber mesh, and a 100% acrylic polymer-based or silicone-enhanced textured finish coat. The company’s Lotusan finish mimics the properties of a lotus leaf to repel water, resist mold, and rinse clean with rainfall. 800.221.2397. [www.stocorp.com](http://www.stocorp.com). Circle 400.



▲ **OWENS CORNING.** Cultured Stone manufactured stone is made with a minimum 35% recycled aggregate as certified by UL Environment; the products also are Greenguard certified. The product is lighter weight and easier to install than natural stone; the variety of styles and textures are created from molds of natural stones. Del Mare LedgeStone in Sangria is shown here. 800.438.7465. [www.culturedstone.com](http://www.culturedstone.com). Circle 401.



▲ **BASF.** Senergy Senturion III water-drainage EIFS features a secondary air/water-resistive barrier and a pre-formed drainage mat that channels incidental moisture to the exterior. The mechanically fastened EPS insulation board provides an additional R-value of 4 per inch. The 100% acrylic reinforced base coat is crack resistant, the company says, and the 100% acrylic finish coat resists fading and abrasion; finish coatings with additional dirt and mildew resistance can be specified. A standard palette of 128 colors, along with unlimited custom colors, is available. 800.221.9255. [www.senergy.basf.com](http://www.senergy.basf.com). Circle 402.

ground up for road base or landscaping, or used as clean fill.

### MANUFACTURED STONE

Made with ground concrete aggregate and water, manufactured stone is a lightweight, lower-cost alternative to natural stone. The products also are durable, offering warranties similar to that of fiber cement.

Like other cement-based products, manufactured stone does have higher embodied energy in production.

Some manufacturers are incorporating recycled content and earning third-party certifications. Cultured Stone, for example, is Greenguard certified and has minimum recycled content of 35%.

At end of life, manufactured stone can be ground up for roadways and sidewalks.

### STUCCO AND EIFS

Most stucco today is made with Portland cement and sand, and, like other cement-based products, the raw materials provide for a high embodied energy compared to non-cement products. At the same time, the surface can be low-maintenance, affordable, and durable; offers versatile design options and a breadth of color choices; and is easily repairable, according to the Stucco Manufacturers Association.

Products such as EcoStucco use limestone instead of Portland cement.

EIFS—exterior insulation finish systems—offer a look similar to stucco but with different components and installation. EIFS consists of rigid insulation board with a base coat (acrylic and cement or all acrylic), imbedded fiberglass mesh, and an acrylic finish coat. With a base coat of about  $\frac{1}{8}$  to  $\frac{3}{16}$  inch thick, EIFS are thinner than traditional stucco and therefore have less cement content, more flexibility, and, combined with the imbedded mesh, greater durability.

Though EIFS utilizes virgin foam board, acrylics, and cement, it offers the benefits of continuous insulation, a feature that some expect will be required in future energy codes. The board can add an additional R-value of up to 4 per inch.

EIFS' primary challenge is overcoming perceptions brought about by envelope

failures in the mid-90s. According to Kent Stumpe, marketing communications manager for BASF, the problems occurred when insulation board was still applied directly to wood-based sheathings; if moisture penetrated the envelope through faulty window installations or exterior joints, the moisture became trapped and led to damaged sheathing.

Because the failures were in installation, the industry has focused on improved training and requiring a drainage plane, as well as introducing drainable EIFS. The category also is now recognized by the IRC.

### OTHER OPTIONS

Aside from the major types of cladding mentioned above, there are plenty of alternatives available that might fit your needs.

Some architects are designing around steel cladding, which typically contains high recycled content and is recyclable, but also comes with high price and embodied energy levels. Companies like Richlite and KlipTech offer attractive cladding products made from recycled paper.

And of course there's an increase in re-use of reclaimed and salvaged wood and masonry products that has spawned growth in local suppliers who specialize in these materials.

### INSTALLATION

No matter which product you choose, how it performs will largely come down to the quality of installation, especially in how windows and other penetrations are prepared and flashed, and how rainscreens and drainage planes are detailed and installed. (For more on rainscreens, see page 17.) Follow manufacturers' instructions and proper building science practices.

As with most specs, selecting the most appropriate cladding will require weighing a number of factors, from durability to price to environmental aspects, requiring you to prioritize which attributes will help you meet your goals.

*Katy Tomasulo is deputy editor for EcoHOME.*



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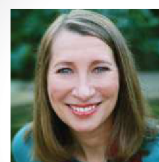
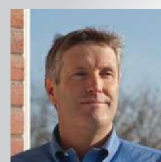
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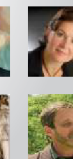
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## new + notable

**1 PROPEX.** Designed for coastal zones or other areas with severe weather, NapaWrap Coastal housewrap shields against moisture while allowing water vapor to escape; its tear resistance allows it to stand up to high winds.

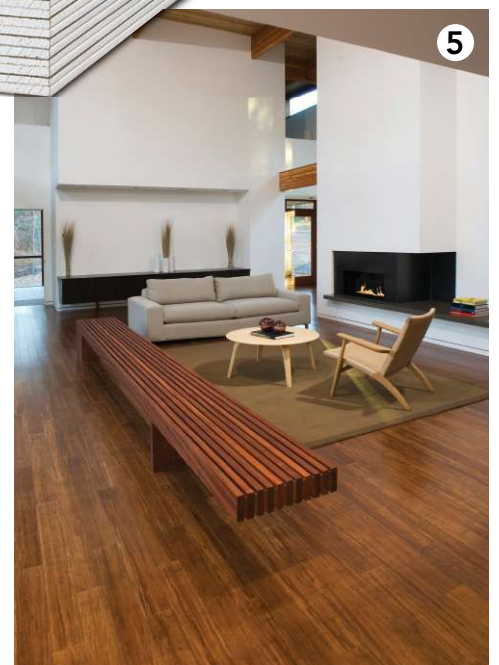
According to the company, the product has twice as much UV protection as competing wraps and can remain uncovered for up to a year. As part of a “tear-free guarantee,” the manufacturer offers free replacement of the housewrap if it tears under the firm’s definition of normal use. 888.437.3423. [www.napa-wrap.com](http://www.napa-wrap.com). Circle 345.

**2 DELTA ELECTRONICS.** The 400-watt HAWT turbine generates 50 kWh per month in 13.4-mph wind conditions. The rotor, which starts up in 8-mph winds, measures 49.6 inches in diameter. It includes electronic overspeed protection. The firm also makes a 1.0-kW model. 888.979.9889. [www.delta-corp.com/windenergy](http://www.delta-corp.com/windenergy). Circle 346.

**3 CERTAINTEED.** Combining two sheets of Type X fire-resistant gypsum board with an inner layer of Green Glue viscoelastic polymer, SilentFX offers a sound transmission class rating of 50 or higher. The drywall, designed for interior walls and ceilings, also features the company’s M2Tech moisture- and mold-resistance technology. It is Greenguard-certified and installs like traditional gypsum panels. 800.233.8990. [www.certainteed.com](http://www.certainteed.com). Circle 347.

**4 U.S. SUNLIGHT CORP.** One of three solar-powered attic fans from the manufacturer, the 9915TR features a 15-watt solar panel and a 14-inch fan capable of ventilating up to 1,750 square feet of attic space. The unit’s deflector design provides a smooth air exhaust passage and increases the overall volume of air movement, the firm says. A solar controller option allows the unit to switch to AC power when solar power is not available and includes a humidistat and thermostat to manage attic humidity levels and temperatures. 866.446.0966. [www.ussunlight.com](http://www.ussunlight.com). Circle 348.

**5 SMITH & FONG.** PlybooStrand FSC-certified bamboo plywood and flooring are urea formaldehyde-free and carry Indoor Advantage Gold and FloorScore certifications, respectively. Plywood panels come in  $\frac{3}{16}$ -,  $\frac{1}{2}$ -, and  $\frac{3}{4}$ -inch thicknesses; the flooring comes in  $\frac{3}{8}$ - and  $\frac{1}{16}$ -inch thicknesses. Both are available in Havana, Sahara, and Neopolitan finishes. 866.835.9859. [www.plyboo.com](http://www.plyboo.com). Circle 349.





**1 OWENS CORNING.** The company is replacing all of its batt insulation products with EcoTouch Pink Fiberglas with PureFiber technology, which is made with a formaldehyde-free formulation and contains at least 50% recycled content. The company claims the new formulation improves installation through reduced dust and particulates and increased workability. The product is certified by SCS for recycled content and by Greenguard for indoor air quality. 800.438.7465. [www.owenscorning.com](http://www.owenscorning.com). Circle 350.

**2 IDEAPAINT.** Single-coat, roller-applied IdeaPaint can be used to turn a surface into a dry-erase board suitable for kitchens, a child's room, or a home office. According to the firm, the paint dries as smoothly as the surface it covers; it won't crack, peel, stain, or yellow; and it can be painted over. The formaldehyde-free, low-emitting product recently earned Greenguard certification. 617.714.1050. [www.ideapaint.com](http://www.ideapaint.com). Circle 351.

**3 HASTINGS TILE & BATH.** The Chelsea H125 faucet offers a WaterSense-certified flow rate of 1.5 gpm. The unit combines a curvaceous, hourglass-like shape with square corners and a slender spout. It comes in 35 finishes. 516.379.3500. [www.hastingstilebath.com](http://www.hastingstilebath.com). Circle 352.

**4 AMERICAN HOMETEC.** The AHQ-T16 point-of-use electric tankless water heater features the company's coil-less technology, which heats water indirectly through heat transfer to prevent lime-scale buildup that can decrease heating efficiency over time. The 16-kW unit can provide heated water for the shower and sink simultaneously, and comes with a slim profile, a brushed-chrome frame, clean black surface, and blue LED smooth-touch controls. 877.662.6457. [www.americanhometec.com](http://www.americanhometec.com). Circle 353.

**5 SOLAR GARD.** Blocking up to 79% of solar heat, this residential window film helps save energy costs, stabilize interior temperature, and reduce glare, according to the manufacturer. The film, which comes in varying tints from clear to dark, also blocks UV rays to protect furniture from fading. It doubles as a safety feature by holding shattered glass in place. 877.273.4364. [www.solargard.com](http://www.solargard.com). Circle 354.

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## new + notable

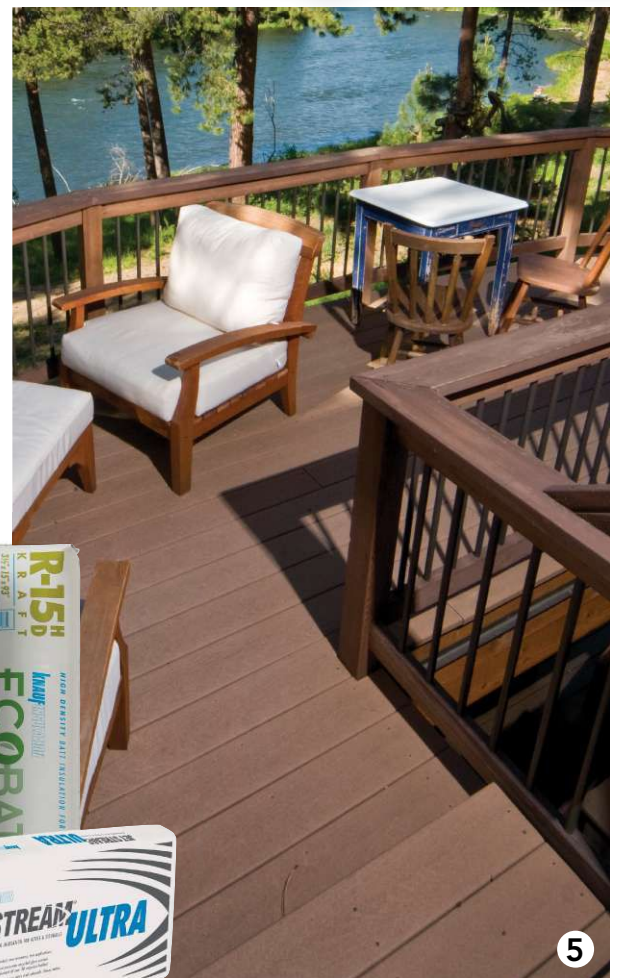
**1 NATIVE TRAILS.** The Yanama vanity features solid FSC-certified cherry wood and a 100% recycled 16-gauge hand-hammered copper foot that coordinates with the company's sinks. The unit measures 24 inches wide by 21½ inches deep by 34 inches high. The foot comes in an antique or brushed nickel finish. 800.786.0862. [www.nativetrails.net](http://www.nativetrails.net). Circle 355.

**2 BORAL BRICKS.** These 4-inch-by-8-inch permeable clay pavers are available in standard and "super permeable" profiles. The standard pavers have ¼-inch-wide joints for an 8% void area. Incorporating six notches around their edges, the super permeable pavers have a 12% void area for more rapid drainage. The void spaces can be filled with small stones appropriate for drainage purposes. 800.526.7255. [www.boralbricks.com](http://www.boralbricks.com). Circle 356.

**3 EC MFG.** Thermal bridging through wood framing accounts for significant heat loss in every home. The rSTUD is an engineered stud with a foam thermal break sandwiched between two pieces of LVL to create typical nominal-dimensioned studs. The high-density foam delivers stud R-values of 7 for a 2x4 and R-21 for a 2x6. According to the company, using the studs can boost a home's efficiency by up to 20% versus traditional lumber. 800.768.7054. [www.ecproducts.us](http://www.ecproducts.us). Circle 357.

**4 KNAUF.** The KISS system combines the manufacturer's EcoBatt insulation or Jet Stream Ultra blowing insulation and a new water-based elastomeric sealant, EcoSeal. Applied to interior framing and sheathing seams, the sealant dries to a flexible, tough film to create an air barrier. It contains no solvents and less than 0.3% VOCs. According to the firm, EcoSeal has an STC rating higher than foam, is Class A rated for fire and smoke, and applies in temperatures from 20 degrees to 115 degrees F. 800.825.4434. [www.knaufinsulation.us](http://www.knaufinsulation.us). Circle 358.

**5 NATURES COMPOSITES.** TerraFence and TerraDeck are made with 94% renewable and reclaimed materials—wheat straw and recycled HDPE. The boards will not splinter or crack and are resistant to moisture, UV rays, insects, and rot, the maker says. The fencing comes in privacy, basketweave, picture frame, shadowbox, ornamental, and three-rail ranch styles. The products are pending SCS certification. 877.810.4029. [www.naturescomposites.com](http://www.naturescomposites.com). Circle 359.





**1 ACCSYS TECHNOLOGIES.** To make Accoya lumber, the company starts with sustainably harvested wood then manufactures it using a non-toxic acetylation process that makes the product more dimensionally stable and durable than tropical hardwoods, the firm says. It is indigestible for many insects, including termites, and is suitable for use as decking and in components for windows, doors, and structural elements. The wood carries FSC, PEFC, and Cradle to Cradle Gold certifications. 972.233.6565. [www.accoya.com](http://www.accoya.com). Circle 360.

**2 LUTRON.** Designed to work with all types of dimmable incandescent, halogen, LED, and CFL bulbs, the Diva-CL eliminates some common problems traditional dimmers have with various lighting technologies, such as lighting “drop out,” lights not turning on when the dimmer is at its lowest setting, and lights turning off unexpectedly. A mechanism behind the wall plate allows homeowners to make manual adjustments based on bulb type. 888.588.7661. [www.lutron.com](http://www.lutron.com). Circle 361.

**3 KOLBE.** With a U-factor as low as 0.19, triple-pane aluminum-clad Ultra Energy Performance casement windows meet Energy Star certifications throughout the United States and Canada. Pine frames are standard, but multiple wood species are available. The casements have a standard 3 1/4-inch jamb depth and a 2 1/4-inch-wide sash. 800.955.8177. [www.kolbe-kolbe.com](http://www.kolbe-kolbe.com). Circle 362.

**4 DUCHATEAU FLOORS.** Wide-plank Riverdale flooring, crafted with FSC-certified wood and finished with a VOC-free hard wax oil, features raised knots and a distressed style for a vintage feel. The planks are 7 1/16 inches wide, 72 inches long, and 3/8 inch thick and are available in five finishes. 619.717.2774. [www.duchateaufloors.com](http://www.duchateaufloors.com). Circle 363.

**5 BOSCH.** Therm tankless water heaters offer a minimum activation flow rate of 0.5 gpm, come with a built-in digital control panel that allows for temperature adjustment in 2-degree increments, and feature built-in turbulators that reduce scale buildup. The heat exchanger’s dual fan and full modulating burner create an even flame pattern to prevent hot spots and corrosion, the maker says. Energy Star-rated natural gas or propane models are available. 866.642.3198. [www.bosch-climate.us](http://www.bosch-climate.us). Circle 364.

## new + notable

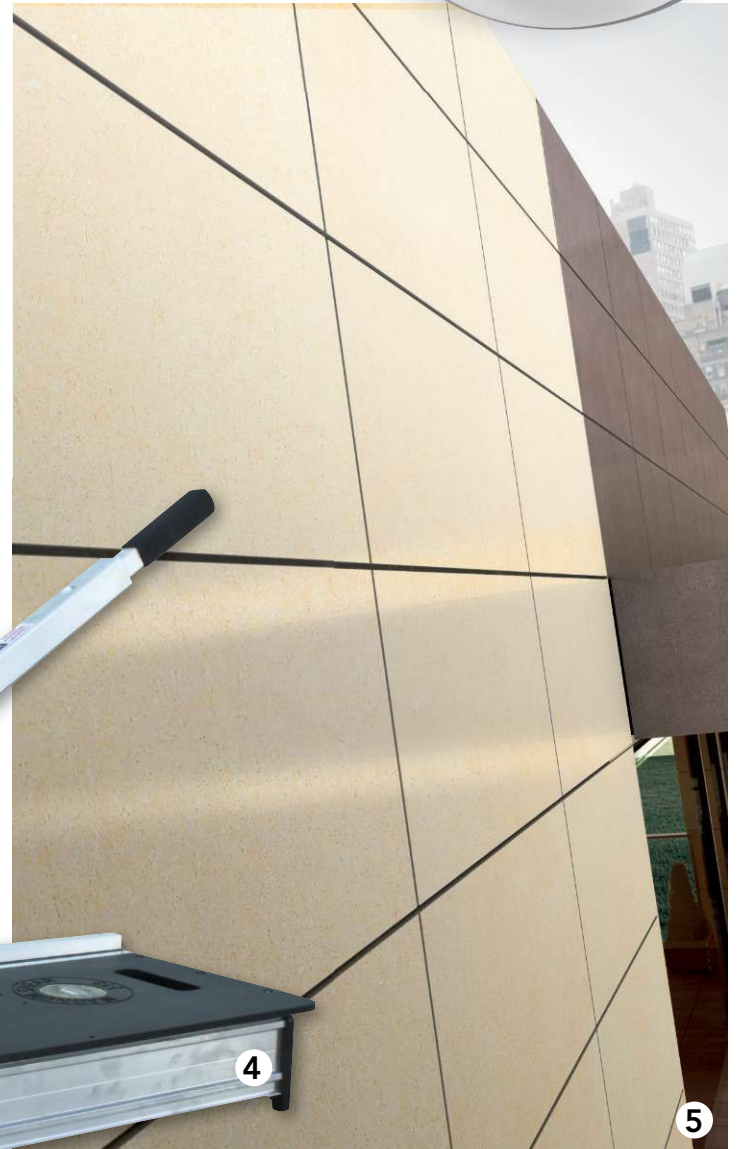
**1 CAROMA.** Profile Smart integrates a sink and faucet with a dual-flush toilet, allowing hand-washing water to be reused for toilet flushing. After the toilet is used, the system sends fresh water through the integrated faucet for washing hands; the water then flows into the toilet tank, where it is stored to be used for the next flush. The toilet flushes at 0.8 gpf for liquids and 1.28 gpf for solids. 800.605.4218. [www.caromausa.com](http://www.caromausa.com). Circle 365.

**2 THINKECO.** The Modlet can be programmed to cut power to appliances when not in use, reducing standby loads and cutting costs by 10% to 20%, according to the firm. The device monitors real-time power equipment consumption; a Web-based interface allows users to create and refine an energy savings plan to shut off power when it's not needed. Initially being introduced for commercial use, the Modlet will be available for homes in the spring. [www.thinkeco.com](http://www.thinkeco.com). Circle 366.

**3 JELD-WEN.** FiberLast exterior doors are made with wood fibers and fiberglass, SCS-certified for at least 35% pre-consumer recycled material. The doors meet CARB regulations for no added urea formaldehyde, and their solid wood stiles are manufactured using a process that releases 96% fewer VOCs than traditional dip treatments, the maker says. The doors come in smooth or grained white or in grained tan. Styles comprise six-panel, sunburst, half-view, full-view, and sidelites. 800.535.3936. [www.jeld-wen.com](http://www.jeld-wen.com). Circle 367.

**4 BULLET TOOLS.** Designed to perform the same tasks as circular saws but requiring no electricity and generating no dust, the Magnum shear cuts laminate flooring, wood flooring, and fiber-cement siding. It is made of 90% recycled aluminum and plastic. Blades last 20 times as long as traditional power saw blades, the manufacturer says. Heavy-duty and medium-duty versions are available. 800.406.8998. [www.bullettools.com](http://www.bullettools.com). Circle 368.

**5 CERACASA.** Bionic Tile reacts with the sun and humidity to convert nitrogen oxide (NOx) gases into water-soluble nitrogen compounds. According to the company, 200 buildings with the tile can decontaminate a volume equal to 2.638 million square meters of air. It comes in white, ivory, tobacco, and gray colors. 877.737.3742. [www.ceracasa.com/600000\\_en](http://www.ceracasa.com/600000_en). Circle 369.



5

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IAPMO	32	94
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JLC Live	8	-
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Logix	26	70
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Wittus	33	24



## DESERT RAIN HOUSE

"You have to question every building practice you thought was standard," says ML Vidas, sustainability advisor on this new Living Building Challenge project under way in Bend, Ore. Designer Al Tozer calls this the most rigorous process he's experienced, from ensuring net zero-energy and -water performance to product selection and local sourcing. "Specifying materials is a real challenge," he says. "They're pretty strict about the LBC Red List."

1. Walk-off grates
2. FSC-certified and reclaimed wood products
3. R-60 closed-cell foam walls/ceilings
4. Loewen high-performance windows, passive solar design
5. Solar PV and water heating
6. Rainwater harvesting
7. Local sandalwood stone veneer
8. Constructed wetland

# Living Buildings

**W**hen the Cascadia Green Building Council launched its Living Building Challenge (LBC)

program in 2006, its certification requirements were unofficially billed as "beyond LEED." Today, as its first projects are being certified, LBC is considered by many in green building circles to be the most stringent standard in North America.

The program's seven performance "Petals"—Site, Water, Energy, Health, Materials, Equity, and Beauty—are subdivided into 20 "Imperatives" that guide LBC teams and drive the program's philosophy and ambitious goals. And while other rating systems merge prerequisites with optional credits for things like "net-zero energy," "proximity to mass transit," and "indoor air quality," all of LBC's Imperatives are mandatory for full certification. Some, like "embodied carbon footprint" and "appropriate sourcing," challenge even the most experienced designers, and the "net-zero

water" requirement places them in conflict with many existing codes. In addition, buildings must be operational for at least 12 months prior to LBC certification, exceeding all other programs that base their standards on modeled performance.

But perhaps the toughest requirement deals with selecting products, which must meet the evolving Red List Imperative that lays out 14 materials or chemicals restricted from LBC projects. This imperative is so tough—listing ingredients like phthalates, PVC, and added formaldehyde, among others—LBC will grant temporary exemptions so teams can proceed with their projects, but requires those teams to advocate with manufacturers and educate them in support of the Red List ideals.

"The Challenge is unique," says Eden Brukman, vice president of the International Living Building Institute. "We integrate philosophy, advocacy, and certification into one standard." —Rick Schwolsky



For more information about the Living Building Challenge, visit [www.ilbi.org](http://www.ilbi.org).



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